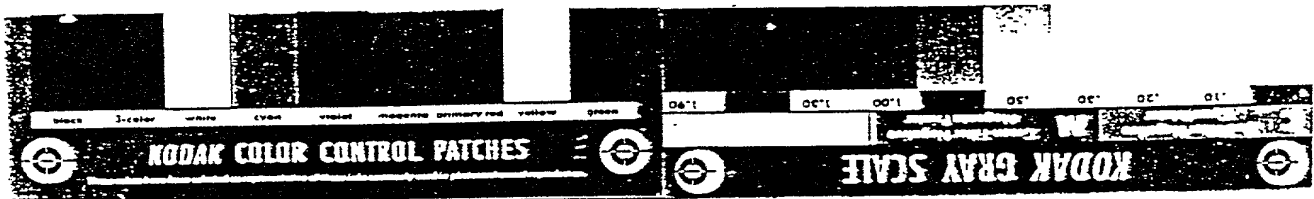


Fig. 1

Color comparison of various passive layers



0000493-074304



Substrate: Zinc-plated screws

Blue chromation:	Left picture half
Invention:	Center
Yellow chromation:	Right picture half

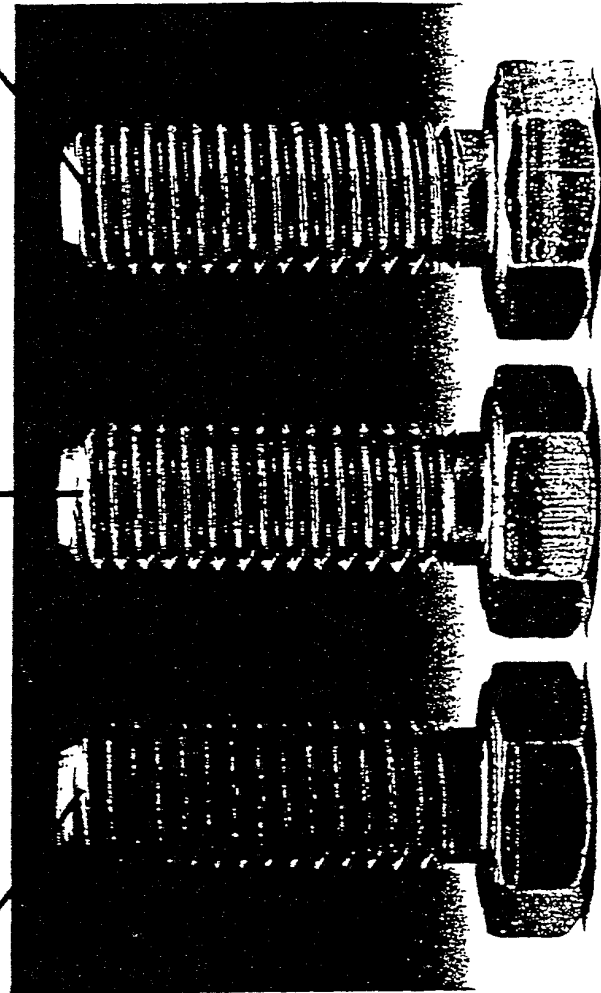
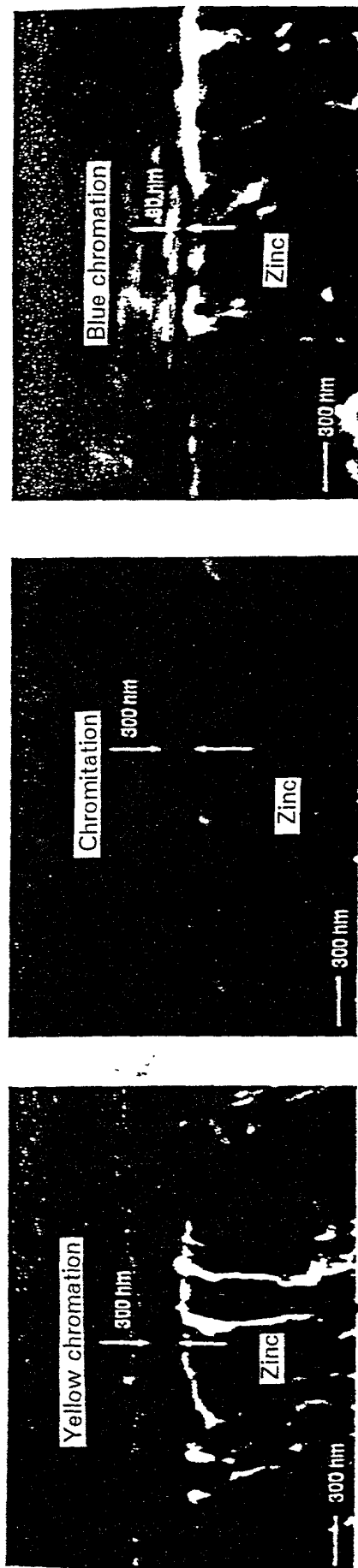
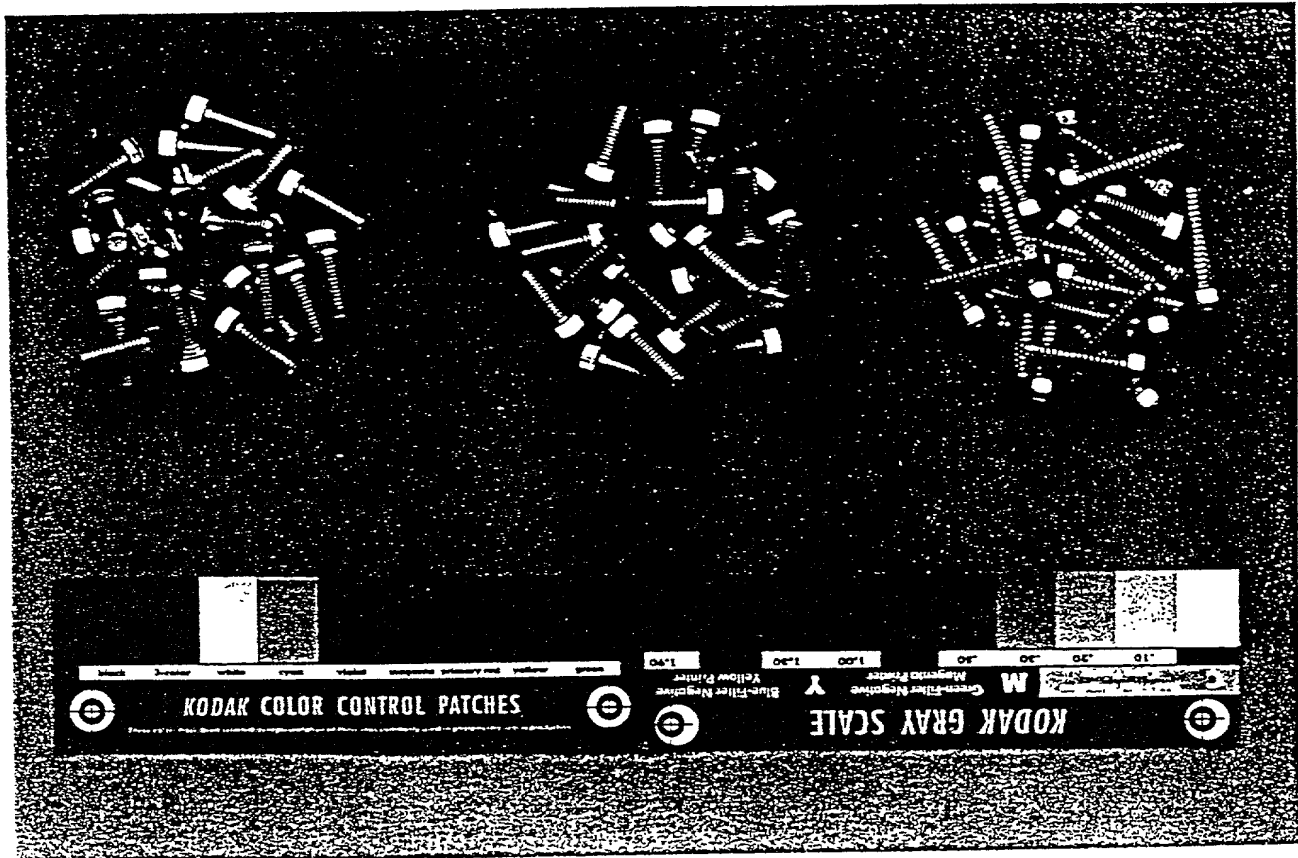


FIG. 2

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Fig. 3

Bandwidth of iridescence according to the present invention  
(on zinc-plated screws)



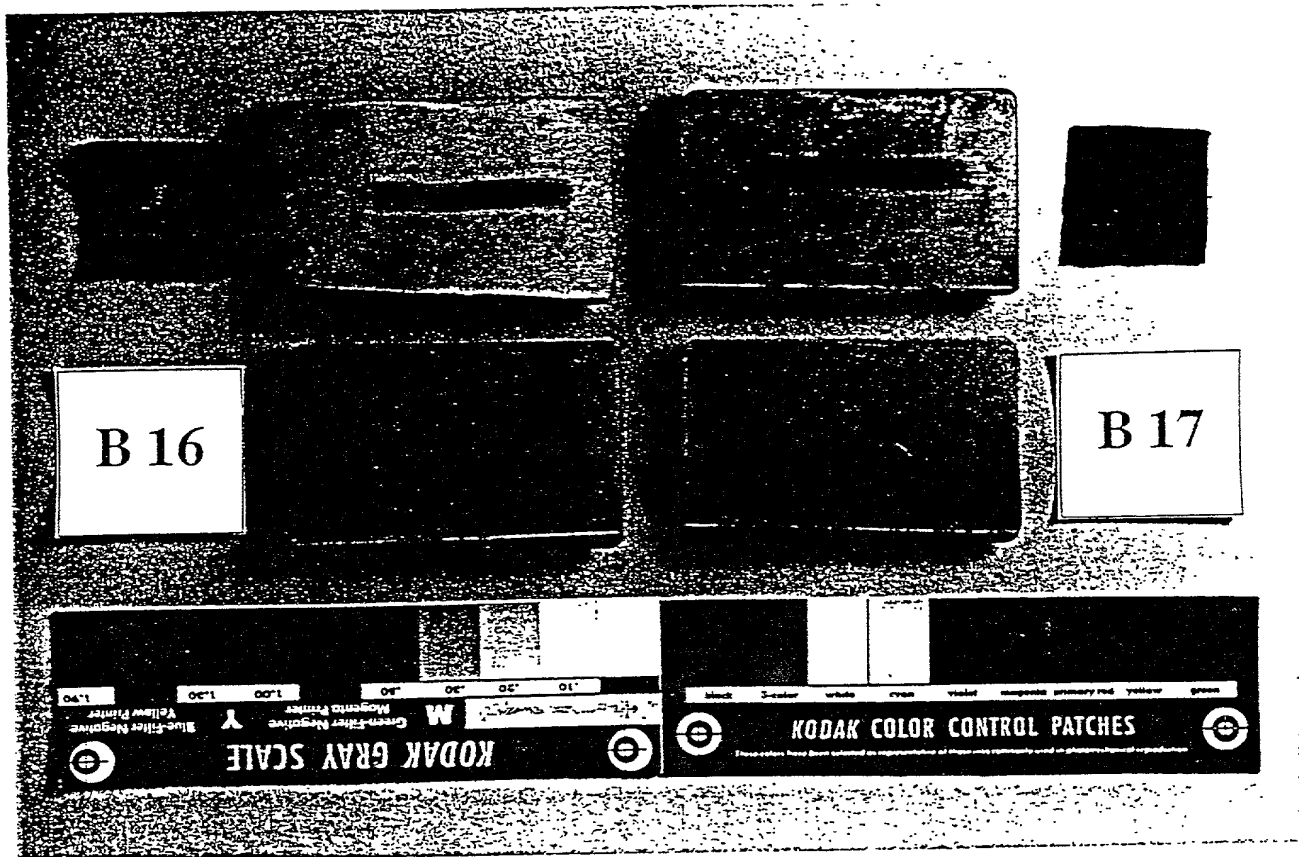
09904993-074394  
F0ET20-2E6H0660

Fig. 4

Comparison test with EP 0 034 040

Example 16

Example 17



The upper picture half, one the outer left and right, shows a black cloth whereby the abrasions on the metal sheets shown in the top picture half were obtained. Layer portions - discernible as whitish stains - are on both pieces of cloth. The lower picture half shows the unmarred layers of the prior art.

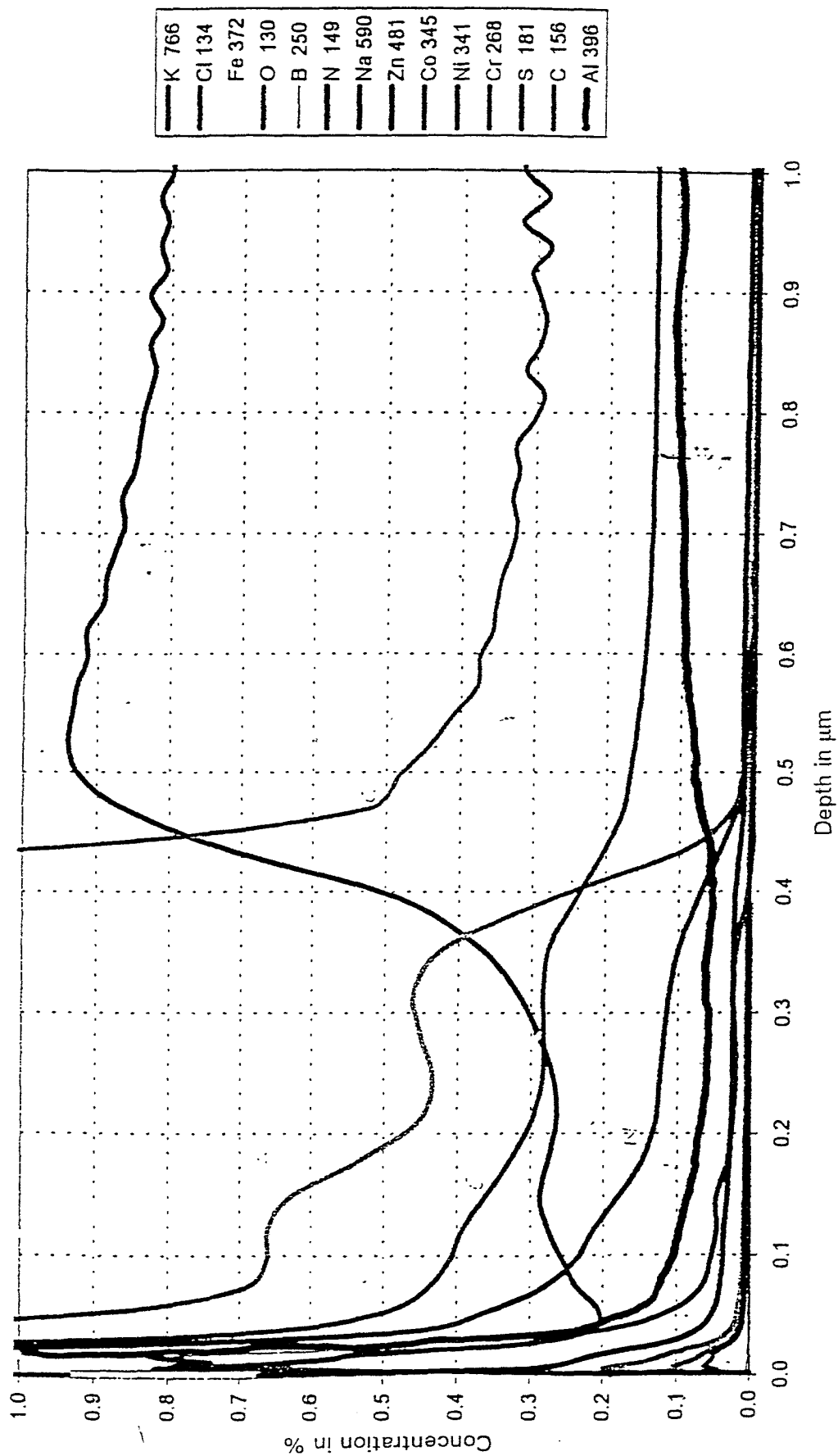
Substrate: Zinc-plated steel sheet.

# TOE TCO E6640660

## Diagram 1

FIG. 5

Pattern 1, Measurement Position A



TO Diagram 26640660

Pattern 1, Measurement Position A

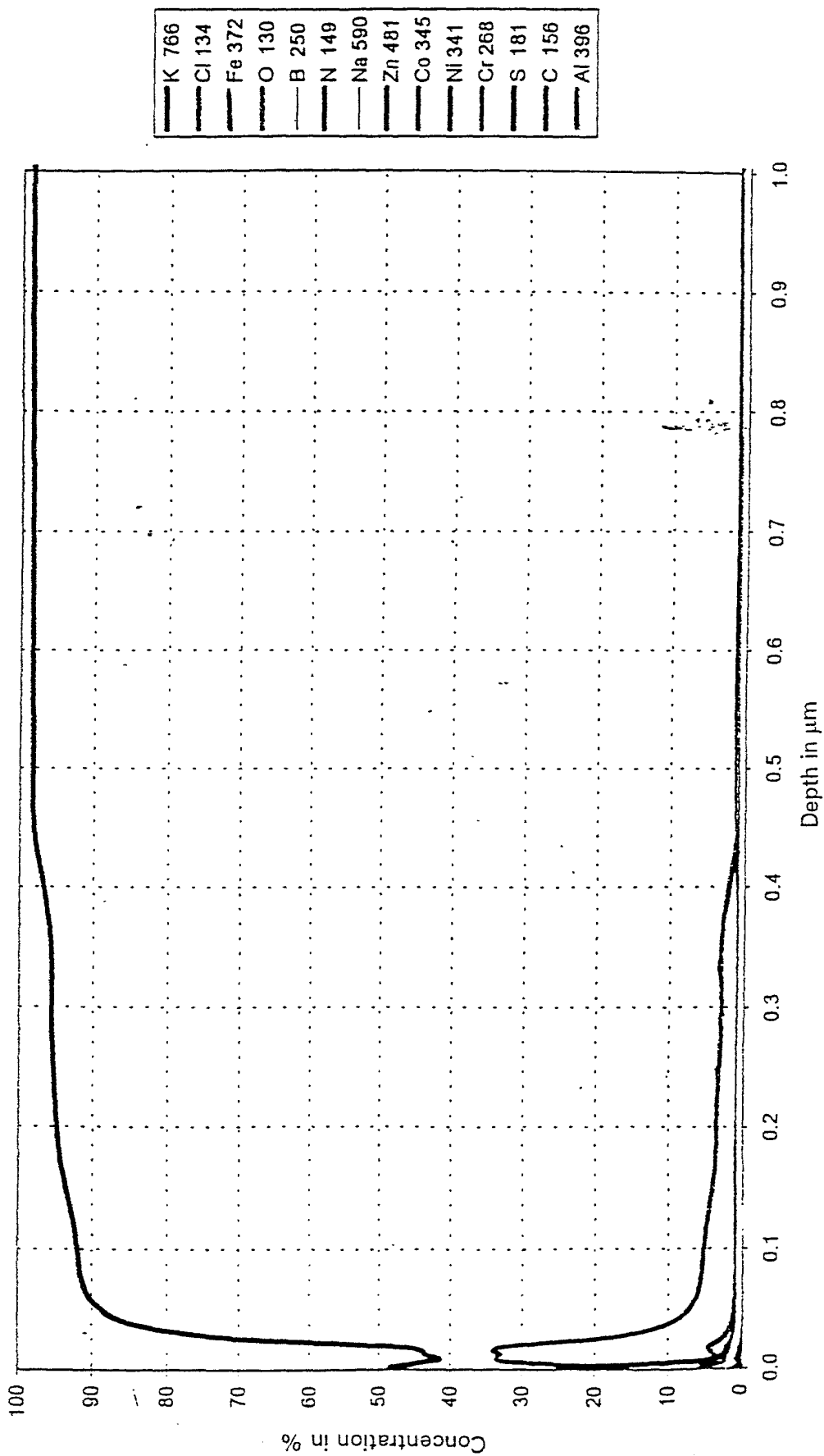


FIG. 6

—	K 766
—	Cl 134
—	Fe 372
—	O 130
—	B 250
—	N 149
—	Na 590
—	Zn 481
—	Co 345
—	Ni 341
—	Cr 268
—	S 181
—	C 156

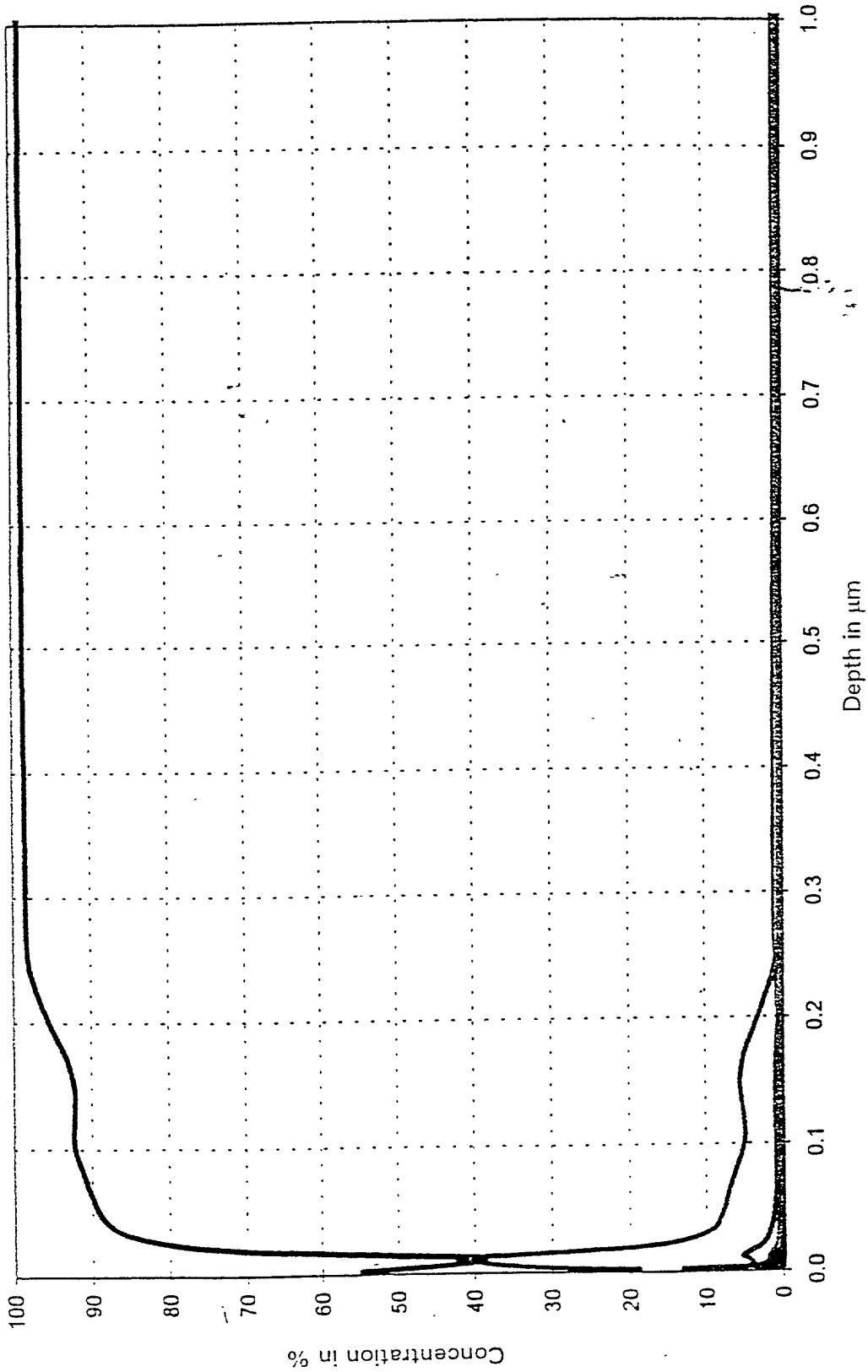


Diagram 1  
FOET 20 00000000  
Sample 1, Measurement Position B

Diagram 2

Sample 1, Measurement Position B

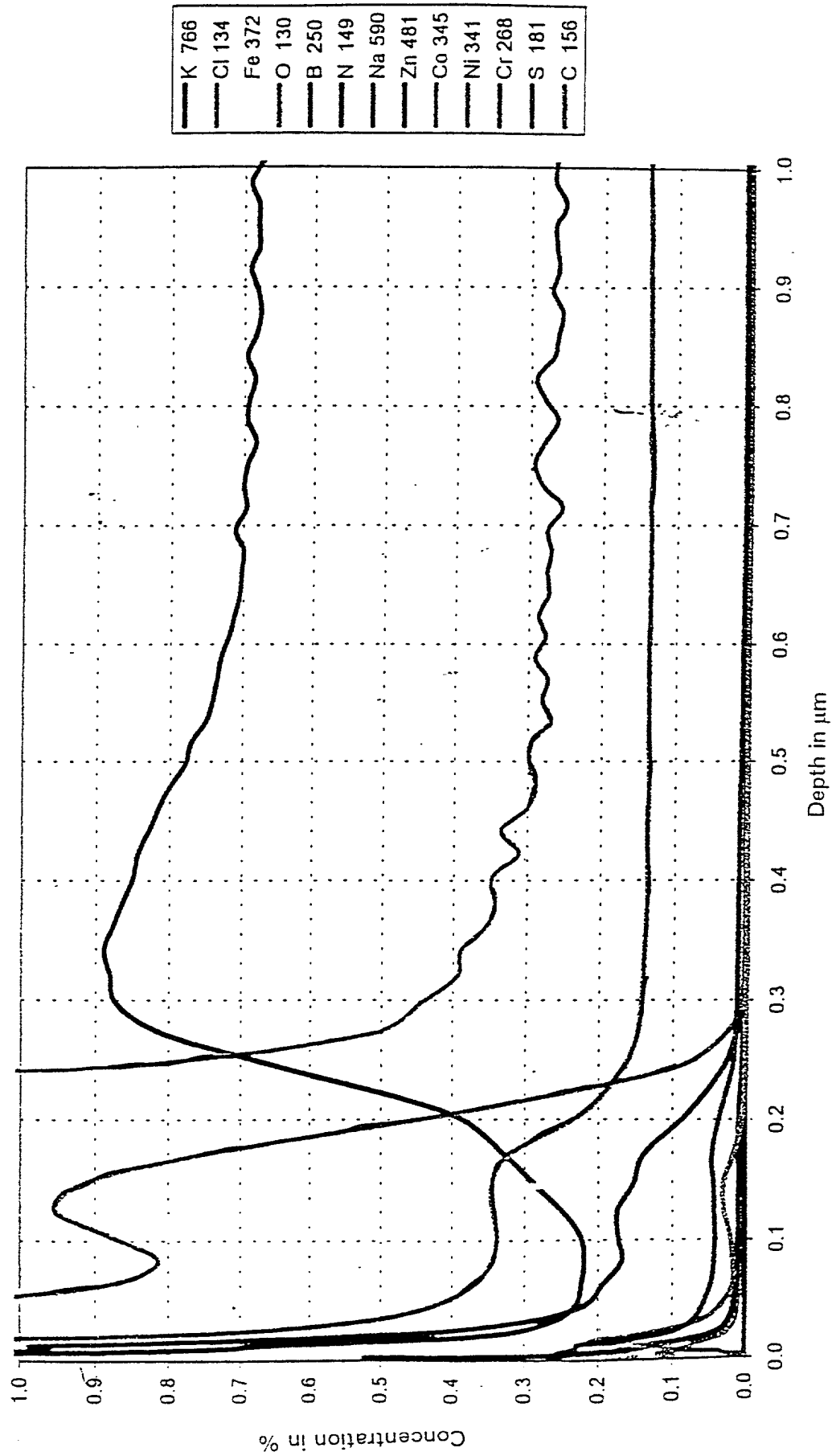
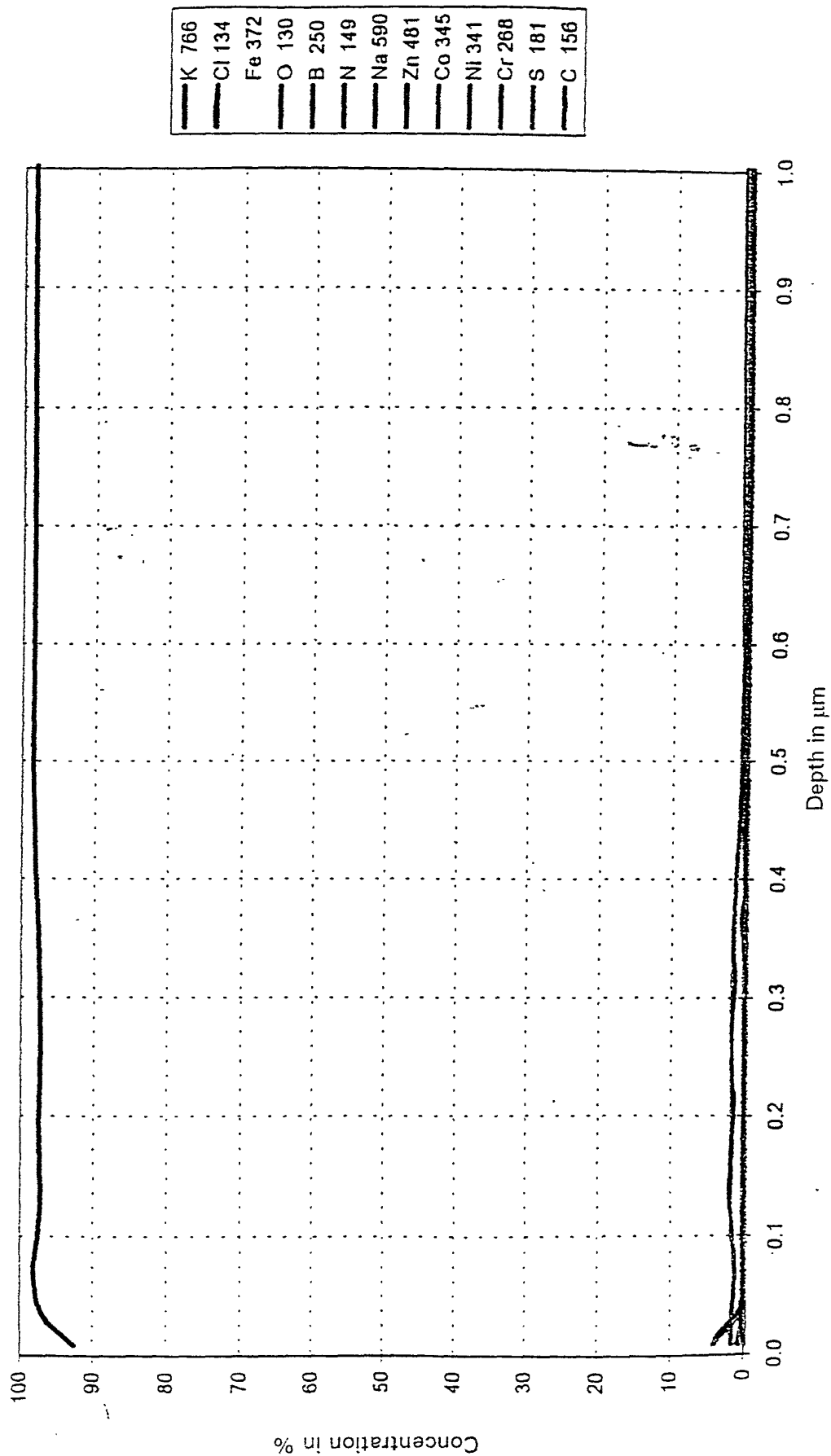


FIG. 8



Sample 2, Measurement Position A

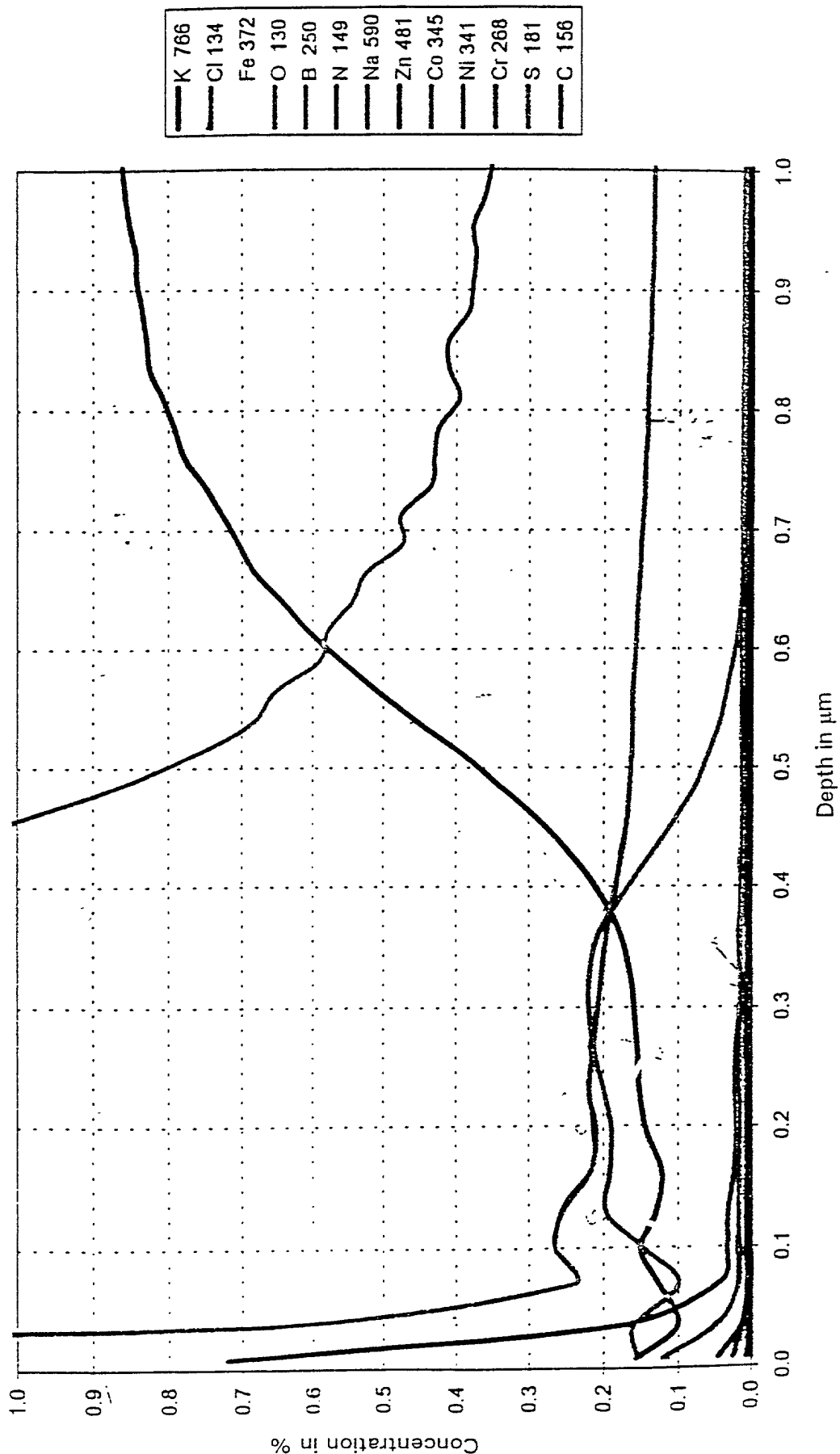


FOET 20" E6640560

Diagram 2

Sample 2, Measurement Position A

FIG. 10



TUEF20" E6640560

Diagram 1

Sample 2, Measurement Position B

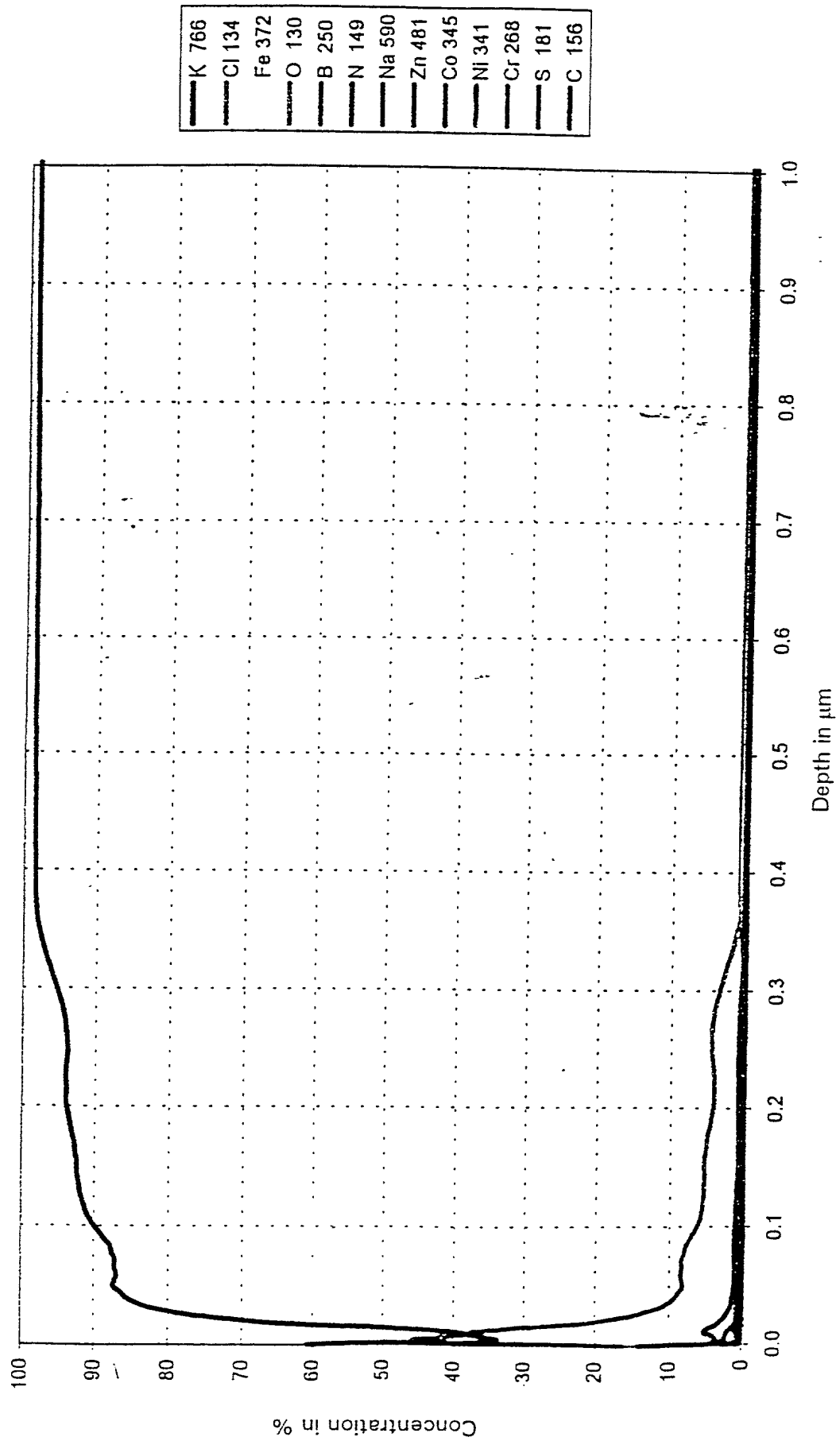


FIG. 11

—	K 766
—	Cl 134
—	Fe 372
—	O 130
—	B 250
—	N 149
—	Na 590
—	Zn 481
—	Co 345
—	Ni 341
—	Cr 268
—	S 181
—	C 156

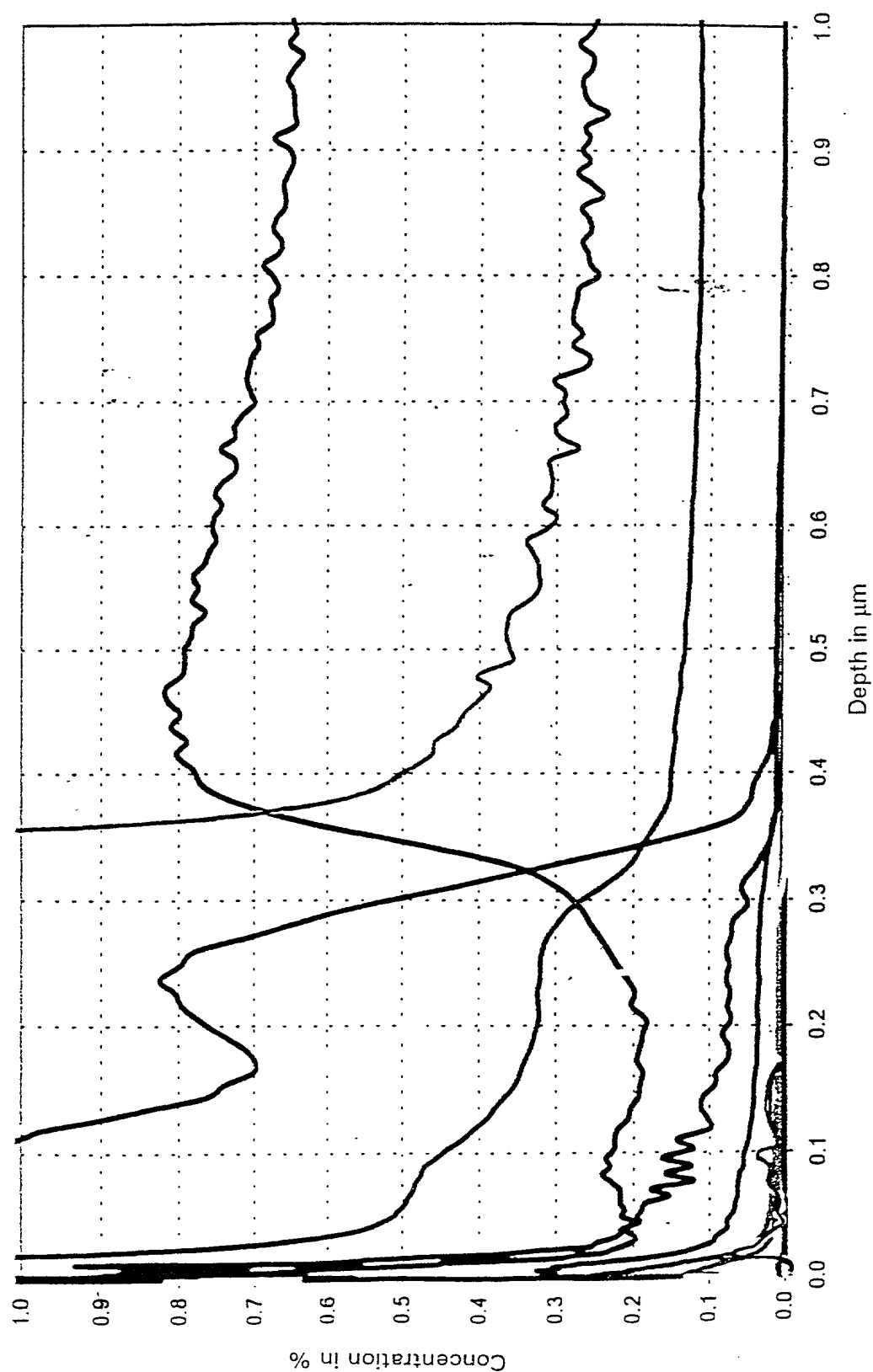


FIG. 12

Diagram 2

Sample 2, Measurement Position B

T0E1'20" E0640060

TOPT20 E6640660  
Diagram 1

Sample 3, Measurement Position A

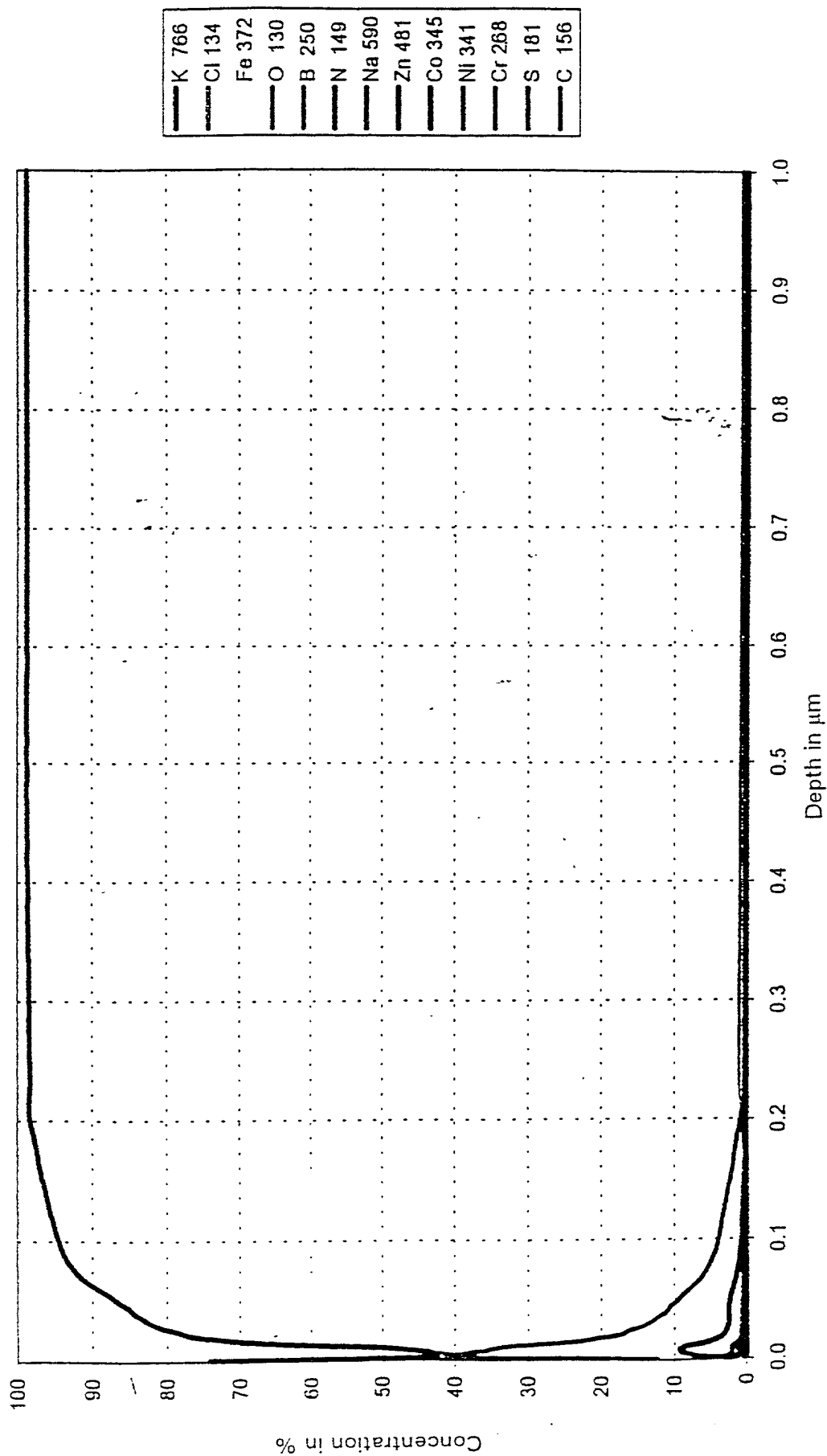
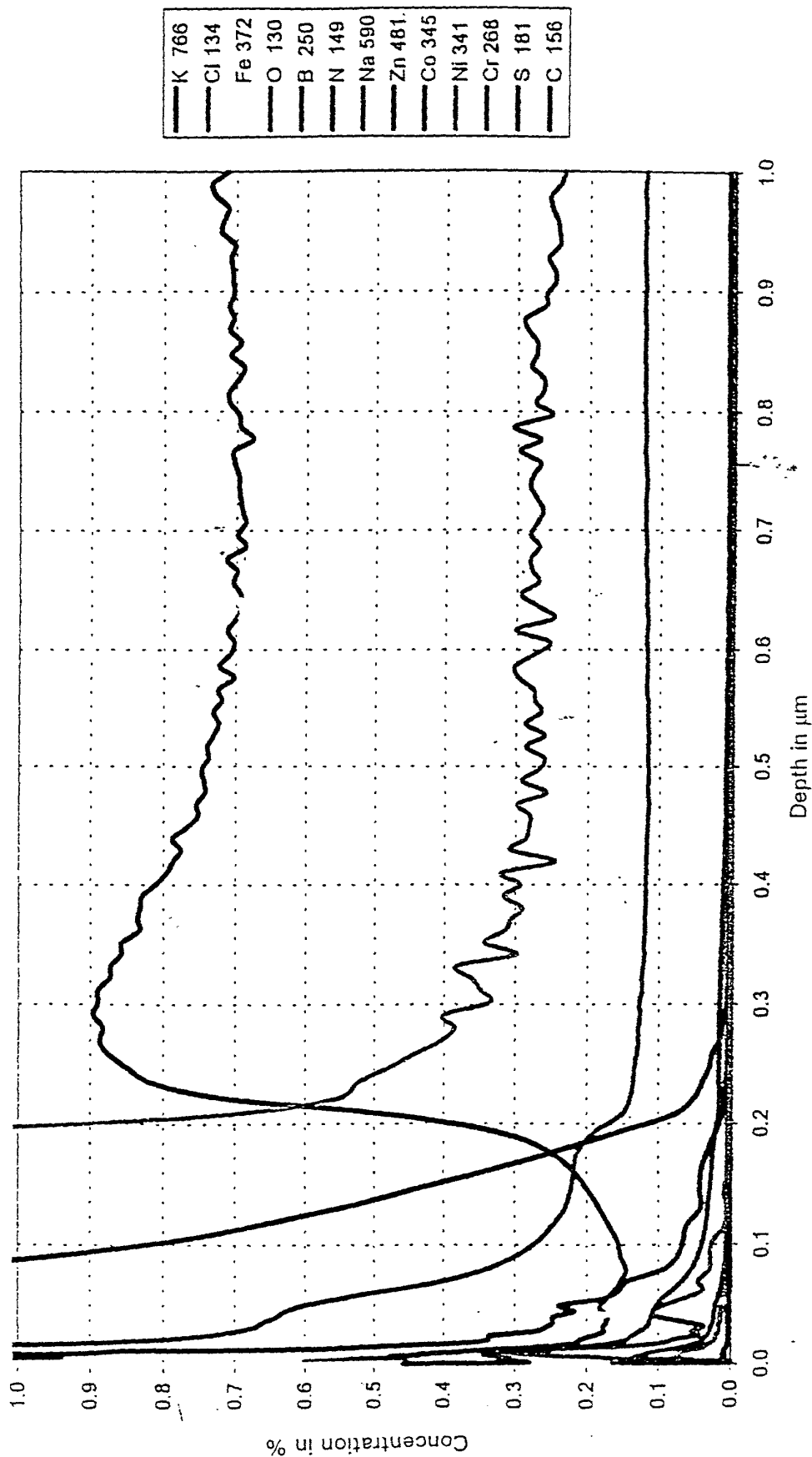
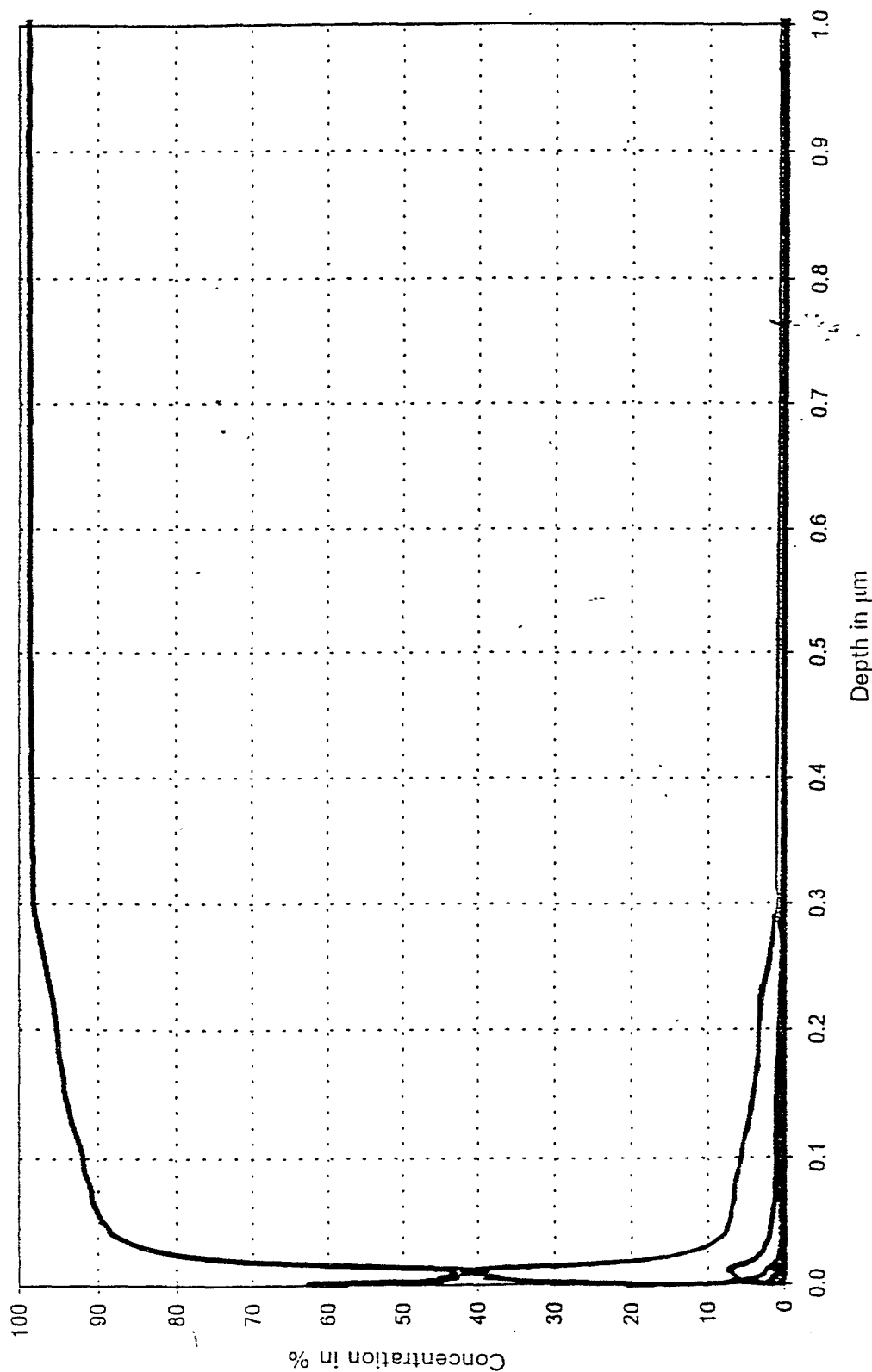


Diagram 2  
TOE 20" E6640660  
Sample 3, Measurement Position A



Sample 4, Measurement Position A



FOET 20" E6640660  
Diagram 2

Sample 4, Measurement Position A

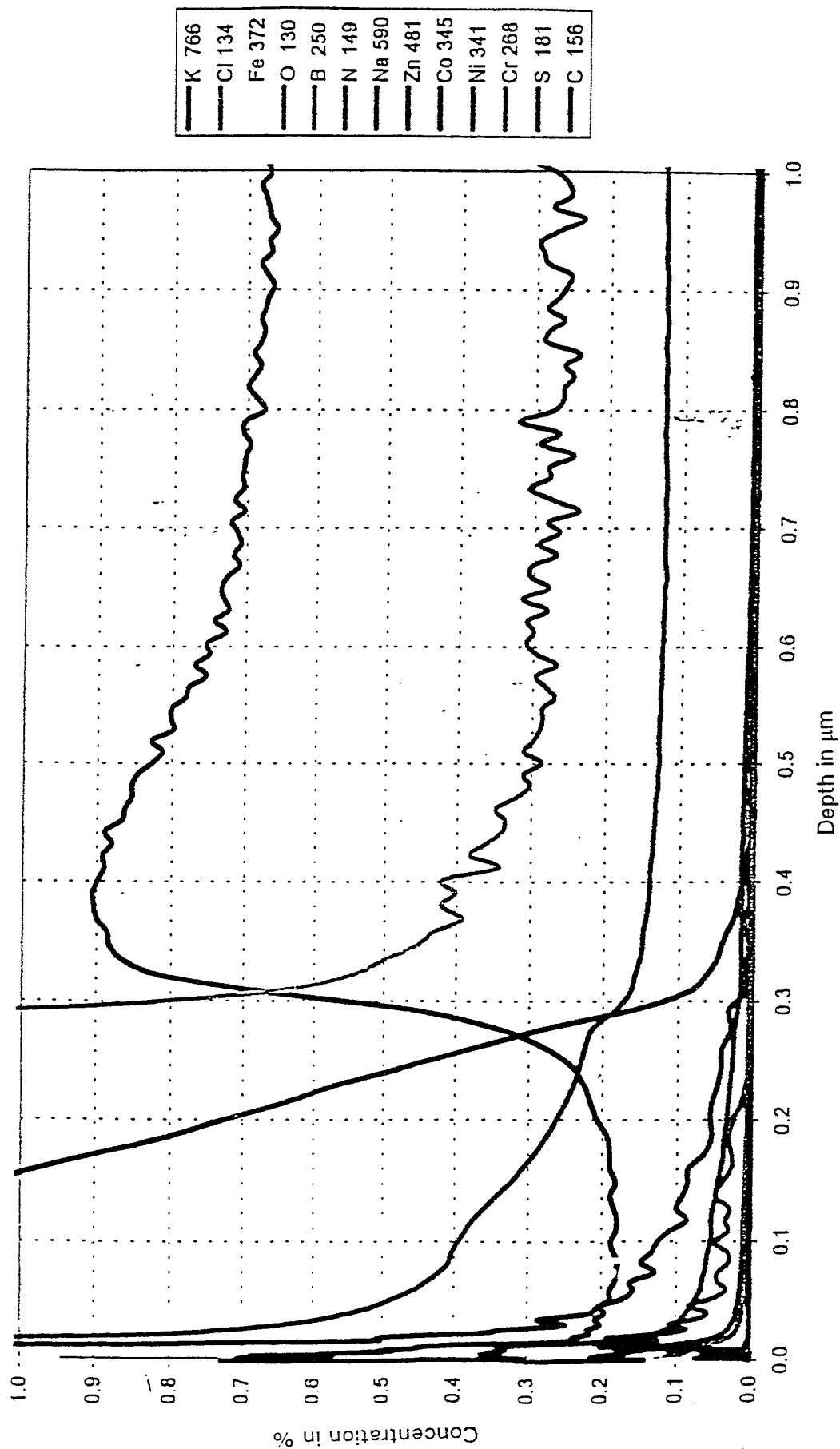
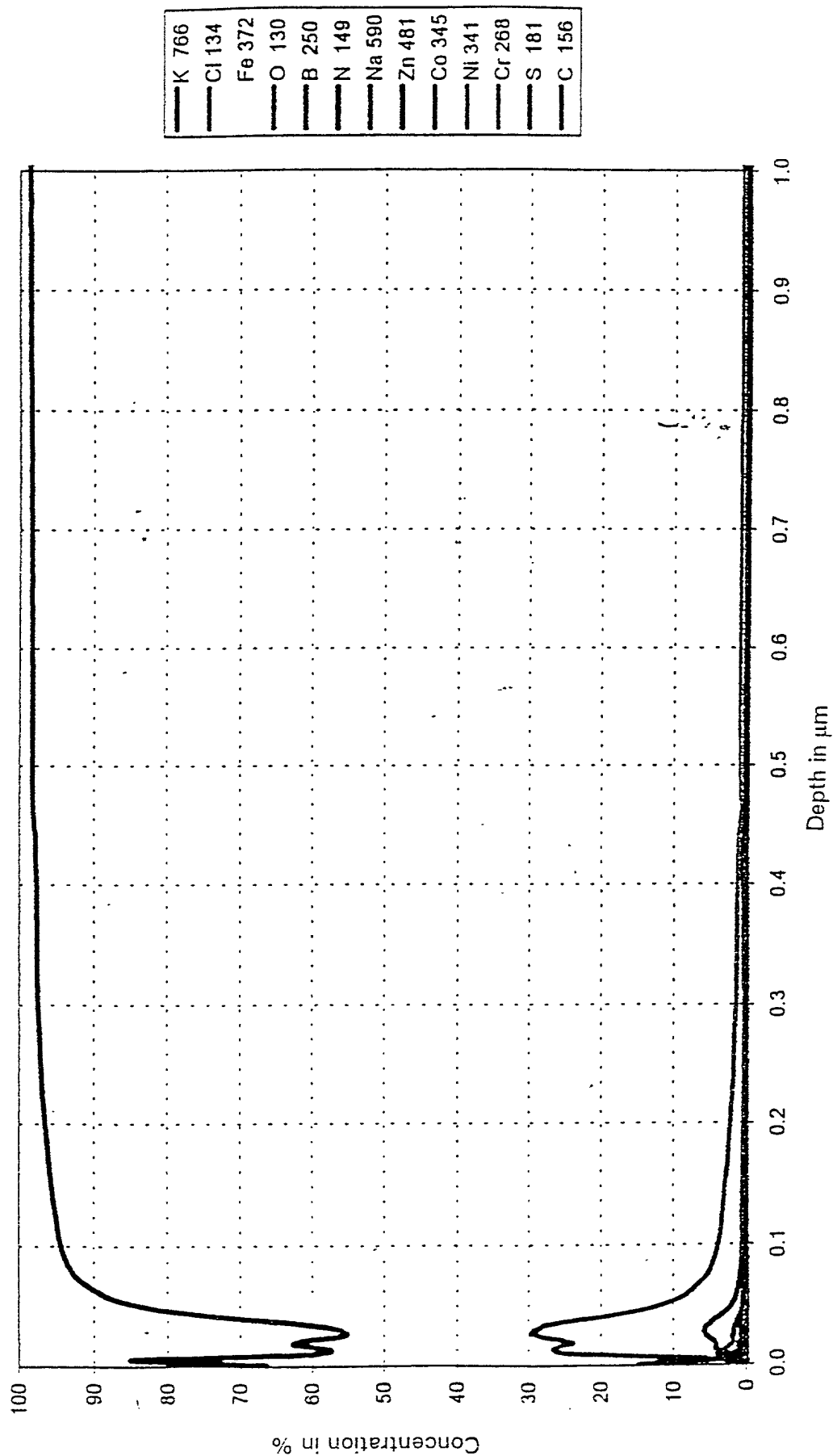


FIG. 16



TOE20 E6640560  
Diagram 1

Sample 5, Measurement Position A



T0E720" E5570660

Diagram 2

Sample 5, Measurement Position A

FIG. 18

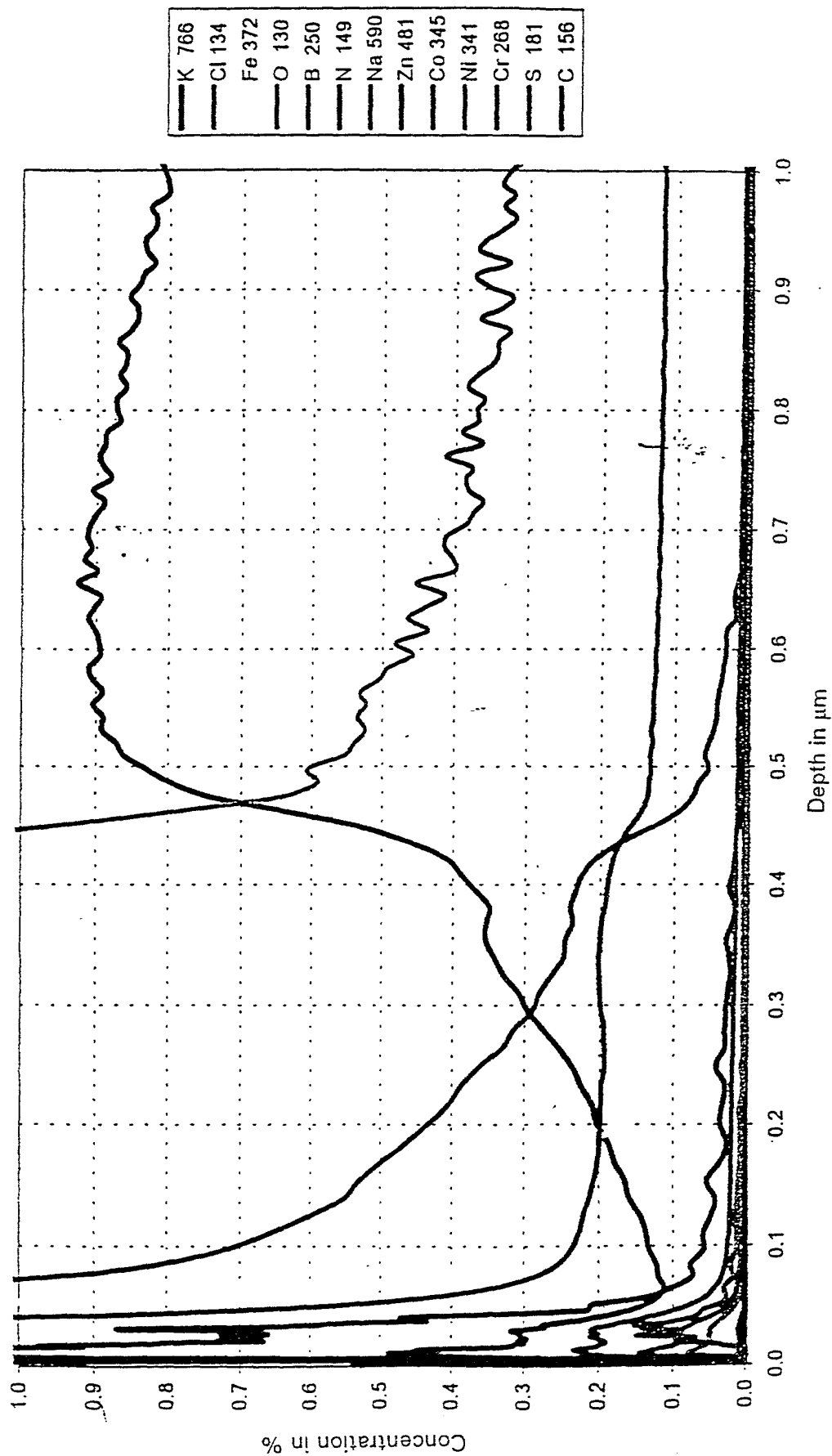
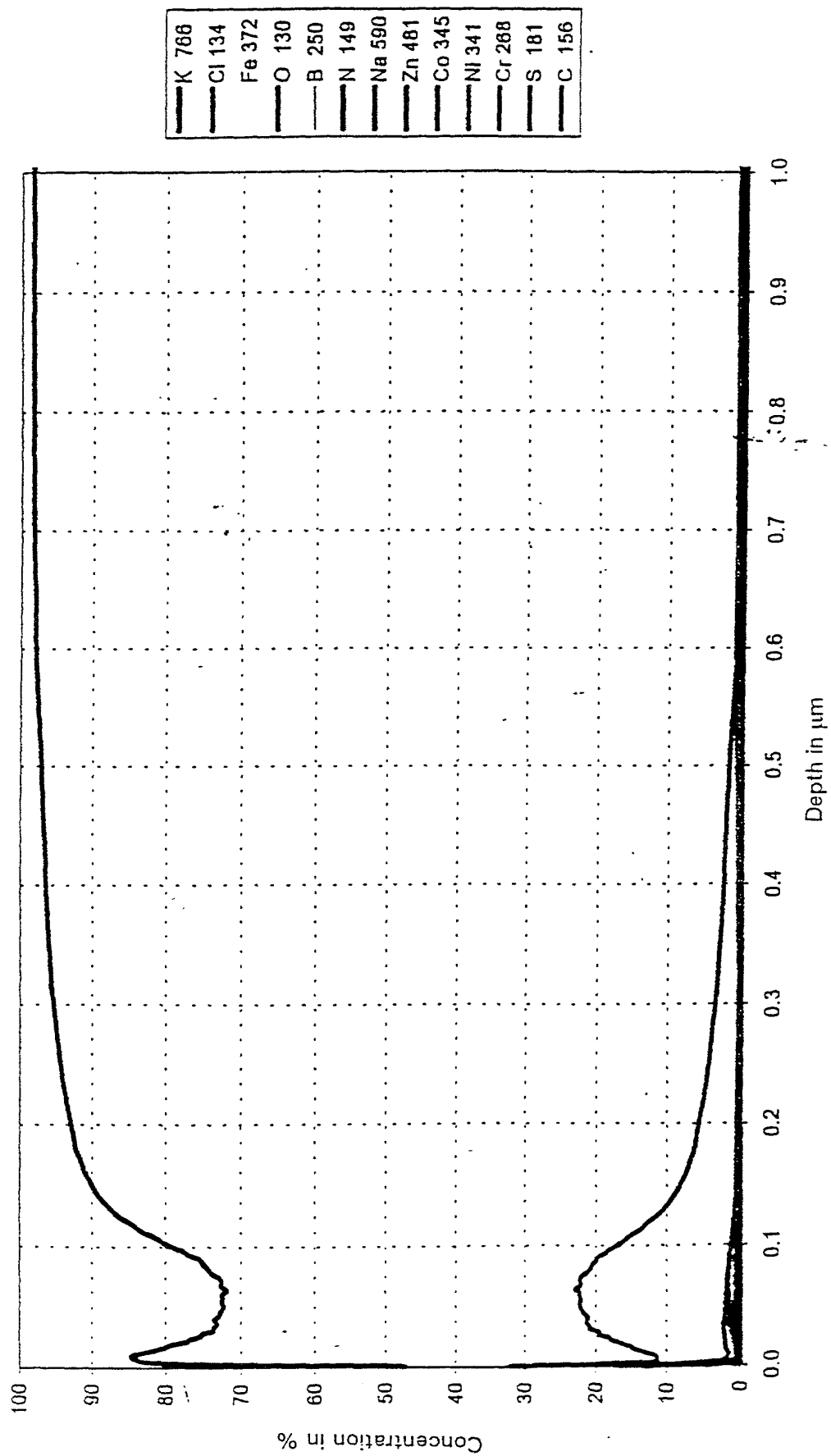
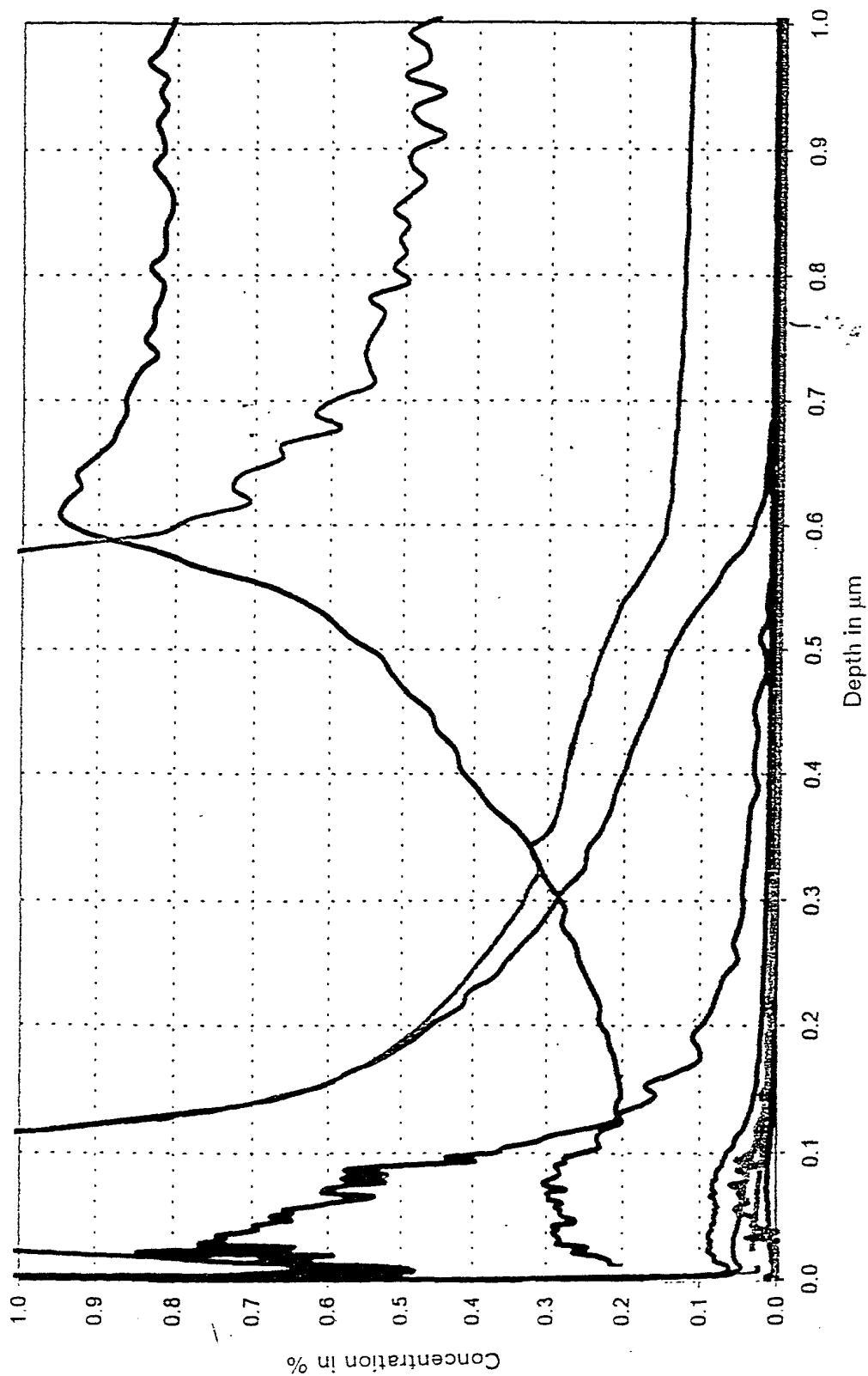


Diagram 1  
T05F20 C6640660

Sample 6, Measurement Position A



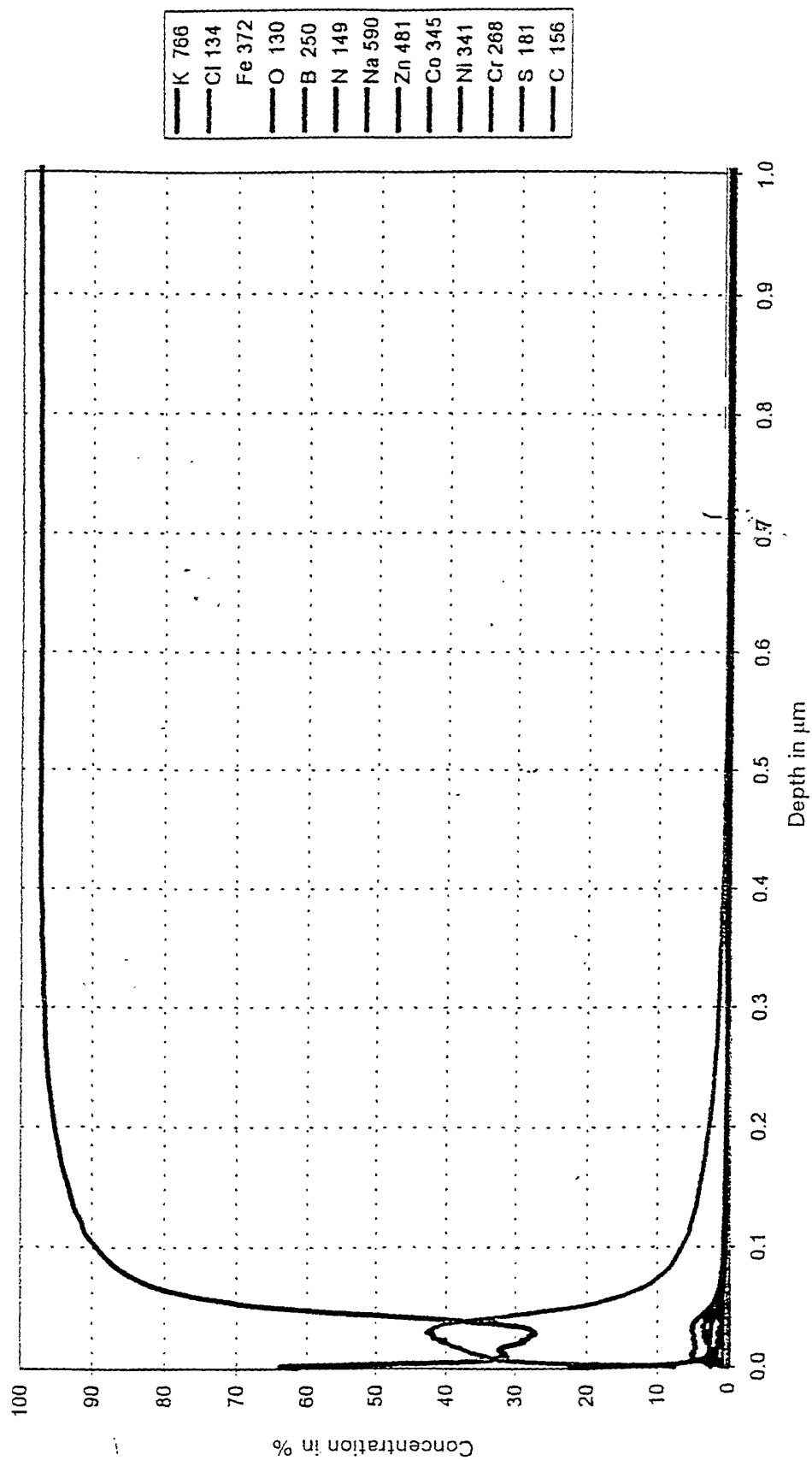
Sample 6, Measurement Position A



TOE Diagram 6540660

FIG. 21

Sample 6, Measurement Position B



TOE T20" E6640660

Diagram 2

Sample 6, Measurement Position B

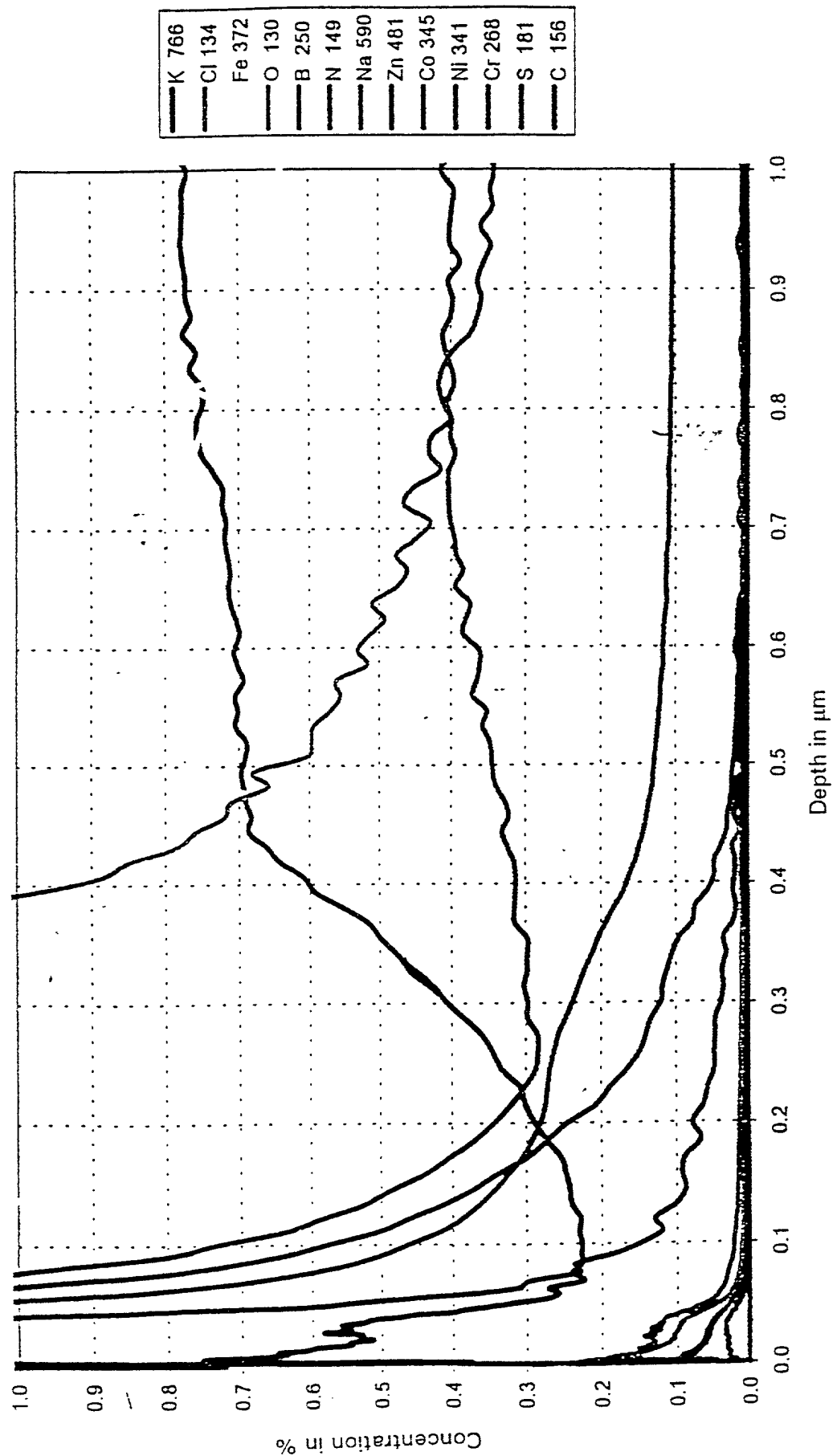
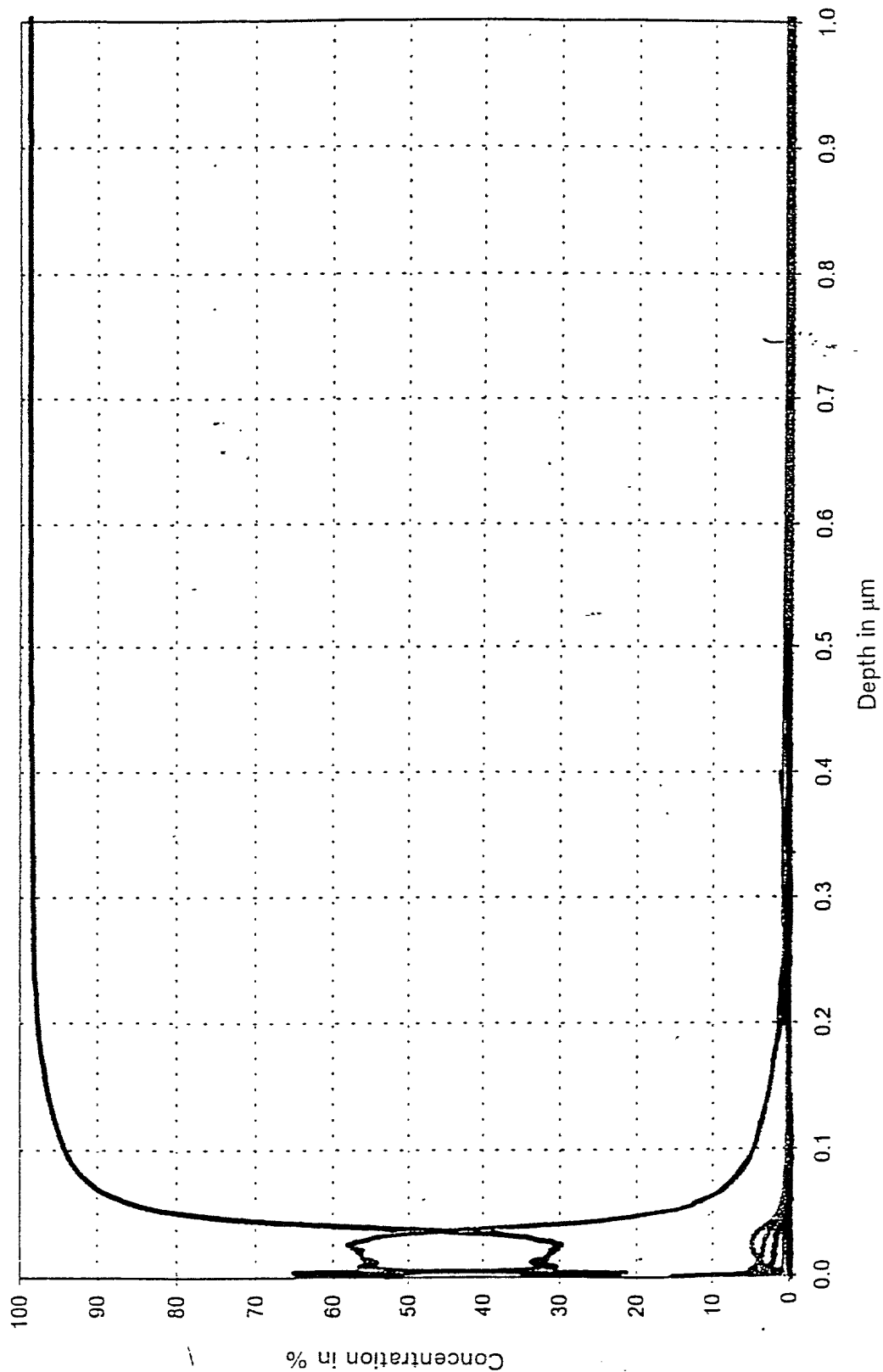


FIG. 22

FIG. 23

TOE Diagram 4510500

Sample 6, Measurement Position C



—	K 766
—	Cl 134
—	Fe 372
—	O 130
—	B 250
—	N 149
—	Na 590
—	Zn 481
—	Co 345
—	Ni 341
—	Cr 268
—	S 181
—	C 156

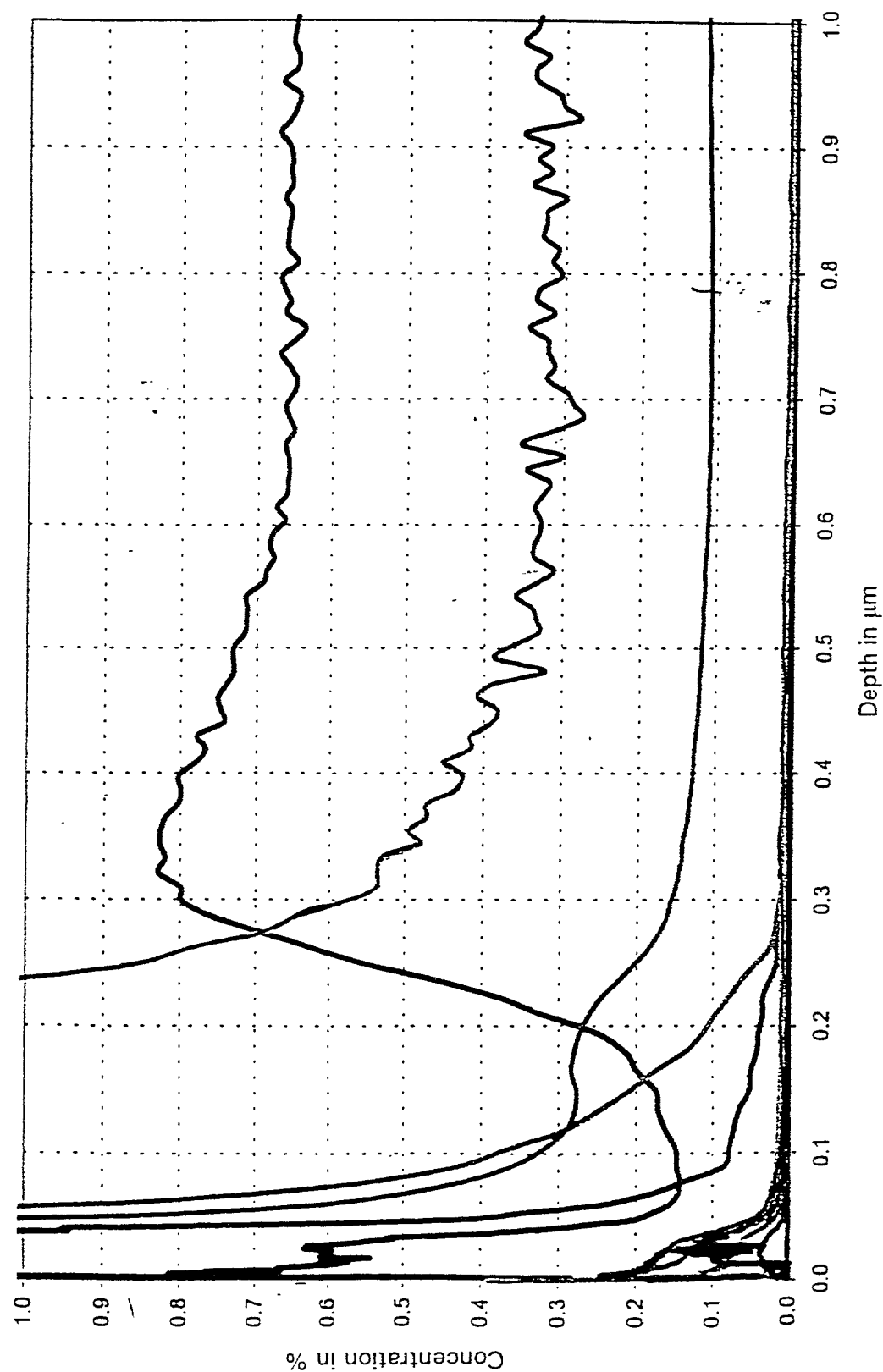


FIG. 24

Sample 6, Measurement Position C

Diagram 2

T06T20" E66T0660

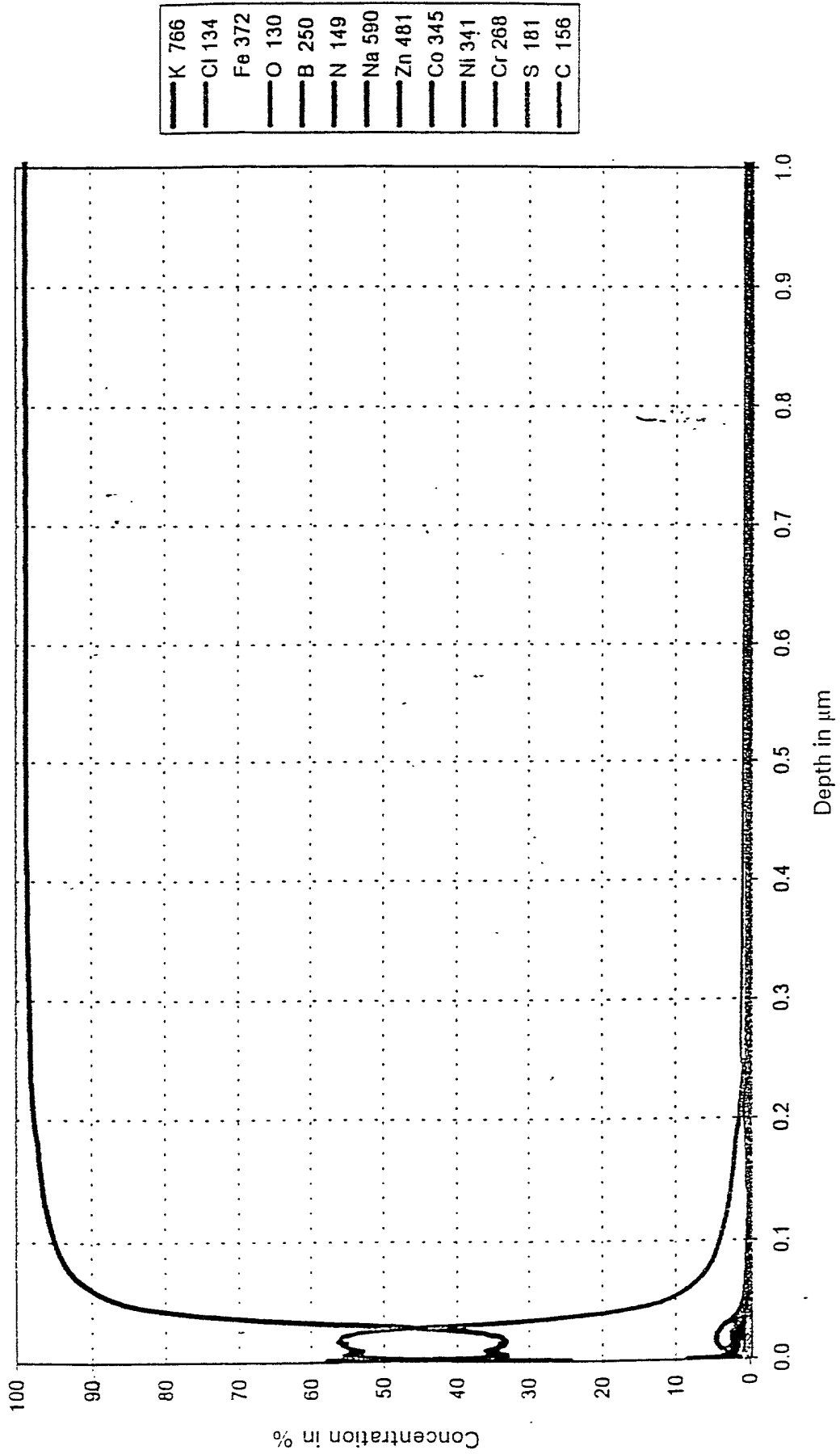


FOET 20" E6640660

Diagram 1

Sample 6, Measurement Position D

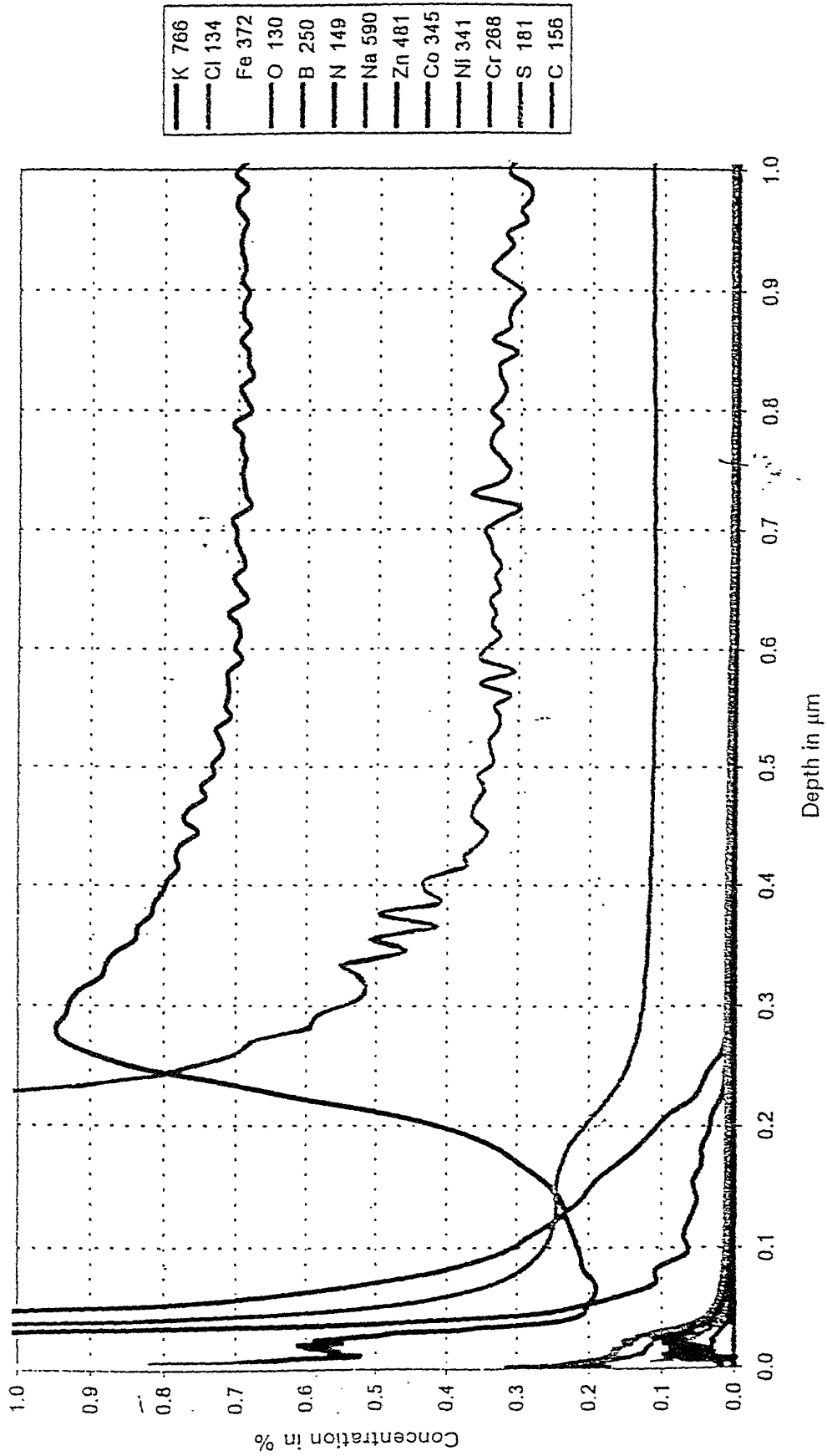
FIG. 25



TOEFCO E6640550

FIG. 26

Sample 6, Measurement Position D



—	K 766
—	Cl 134
—	Fe 372
—	O 130
—	B 250
—	N 149
—	Na 590
—	Zn 481
—	Co 345
—	Ni 341
—	Cr 268
—	S 181
—	C 156

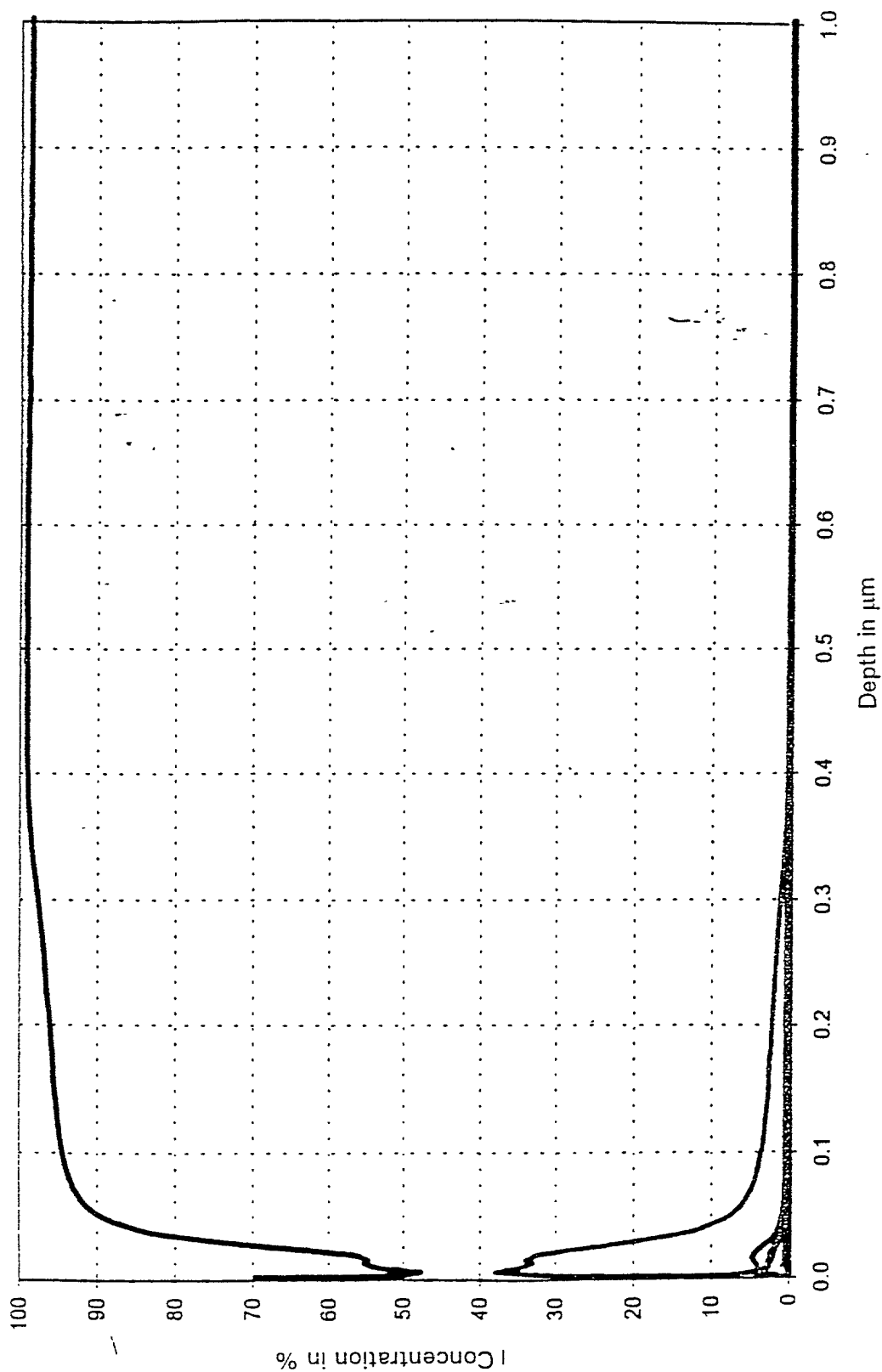


FIG. 27

Diagram 1

Sample 7, Measurement Position A

T00F20" E6640660

—	K 766
—	Cl 134
—	Fe 372
—	O 130
—	B 250
—	N 149
—	Na 590
—	Zn 481
—	Co 345
—	Ni 341
—	Cr 268
—	S 181
—	C 156

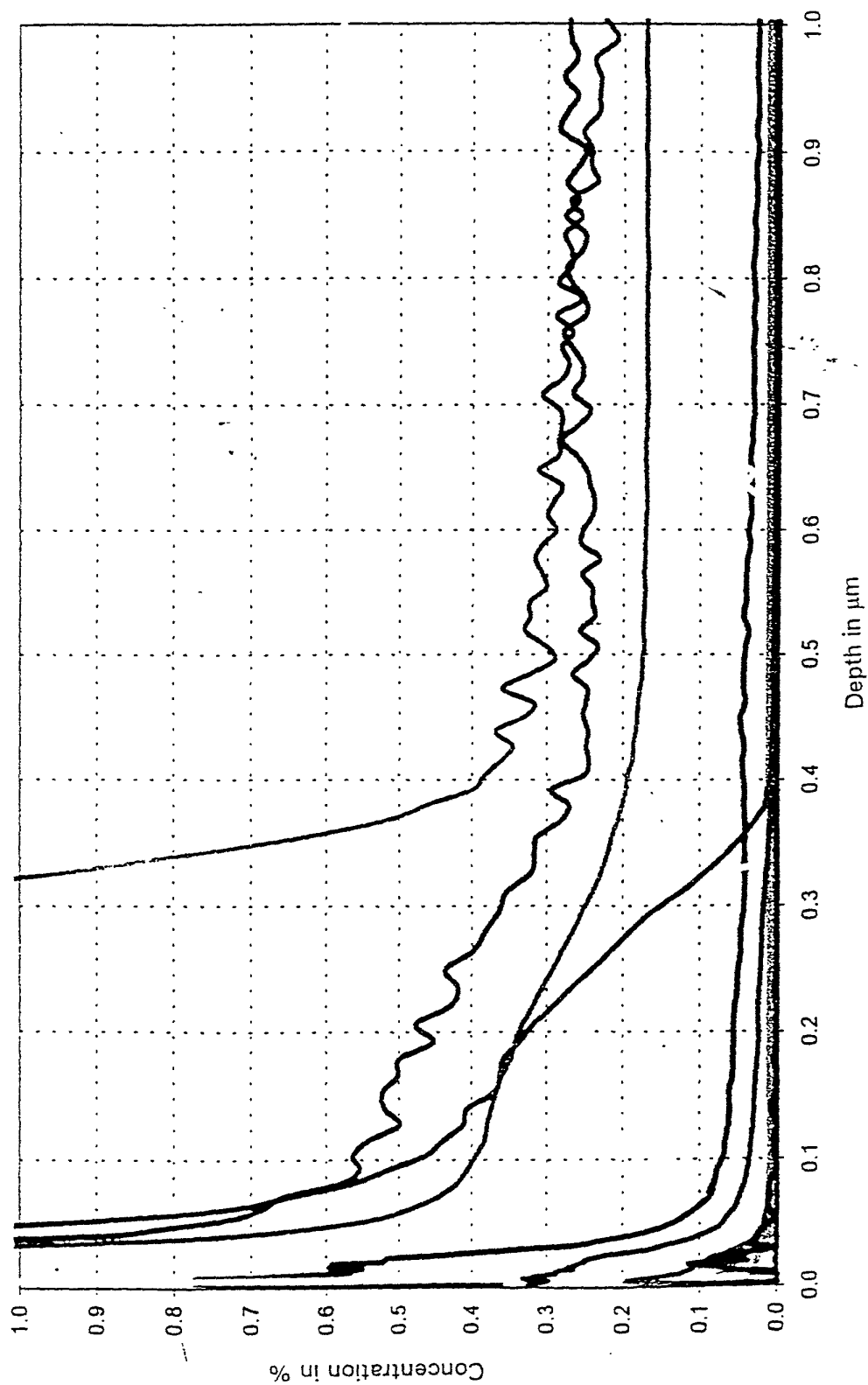


FIG. 28

Sample 7, Measurement Position A

TUE TDiagram256h0650

Diagram 1

Sample 7, Measurement Position B

FIG. 29

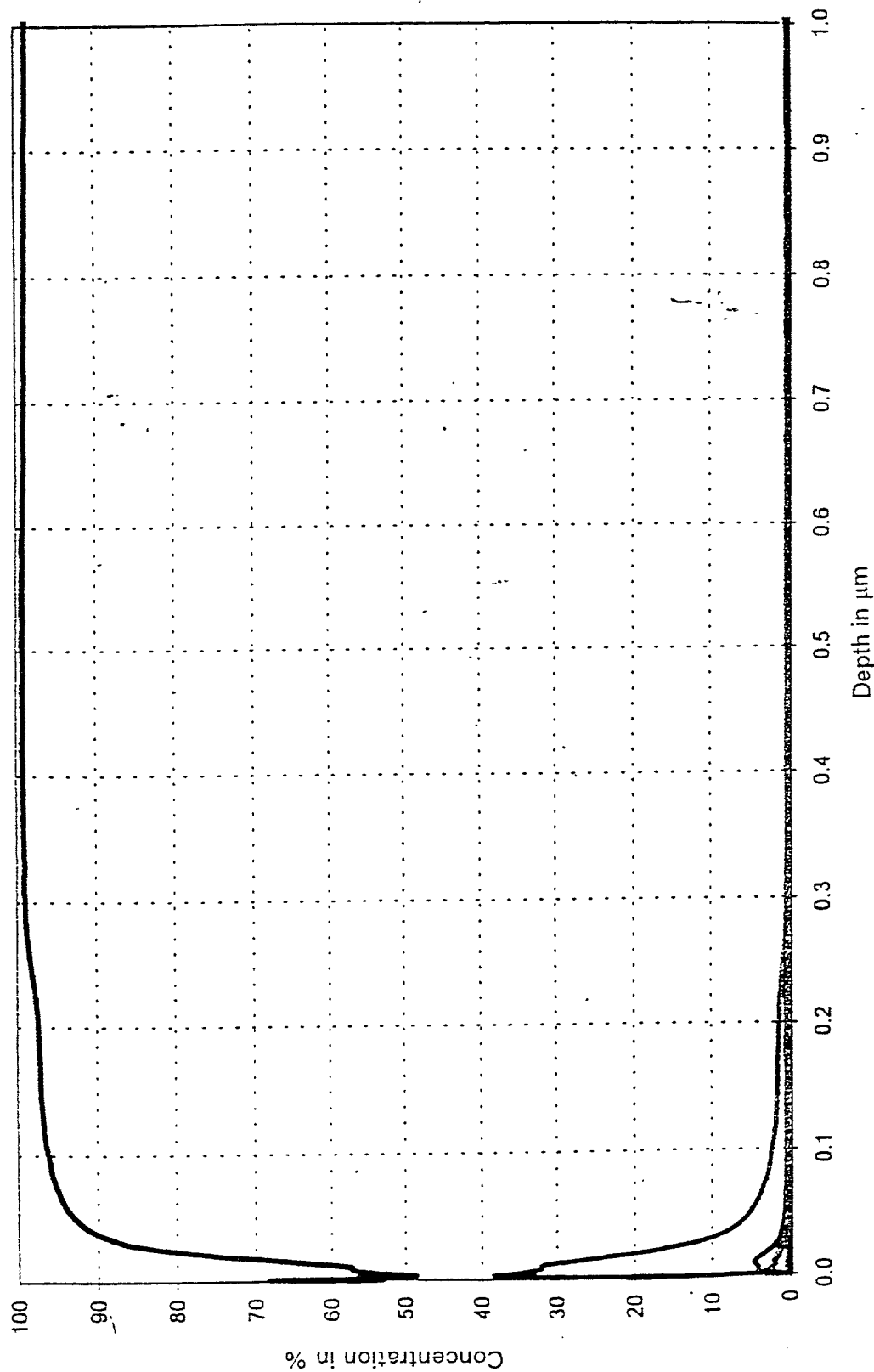
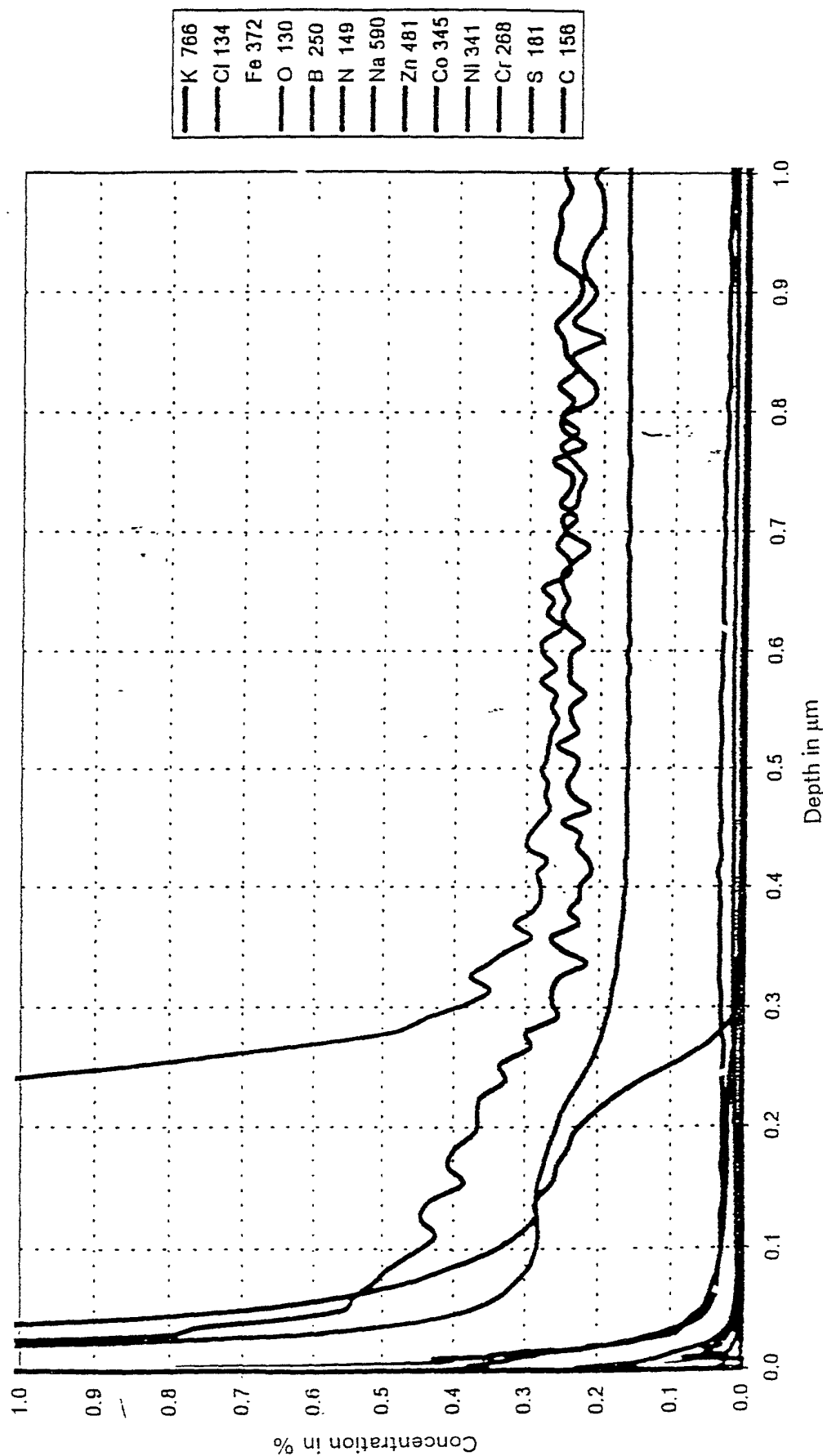


FIG. 30

Sample 7, Measurement Position B



—	K	766
—	Cl	134
—	Fe	372
—	O	130
—	B	250
—	N	149
—	Na	590
—	Zn	481
—	Co	345
—	Ni	341
—	Cr	268
—	S	181
—	C	156

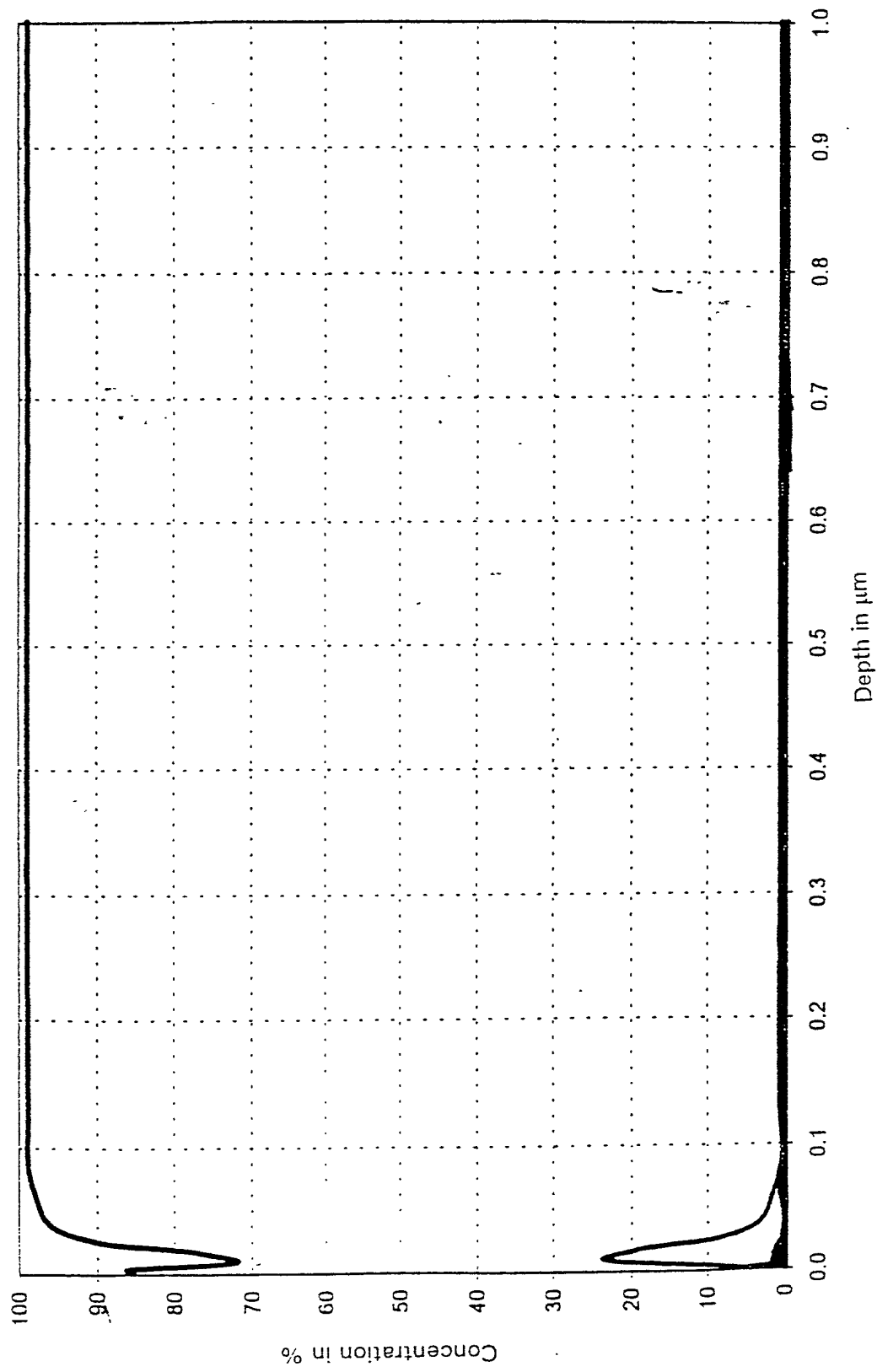


FIG. 31

Sample 8, Measurement Position A

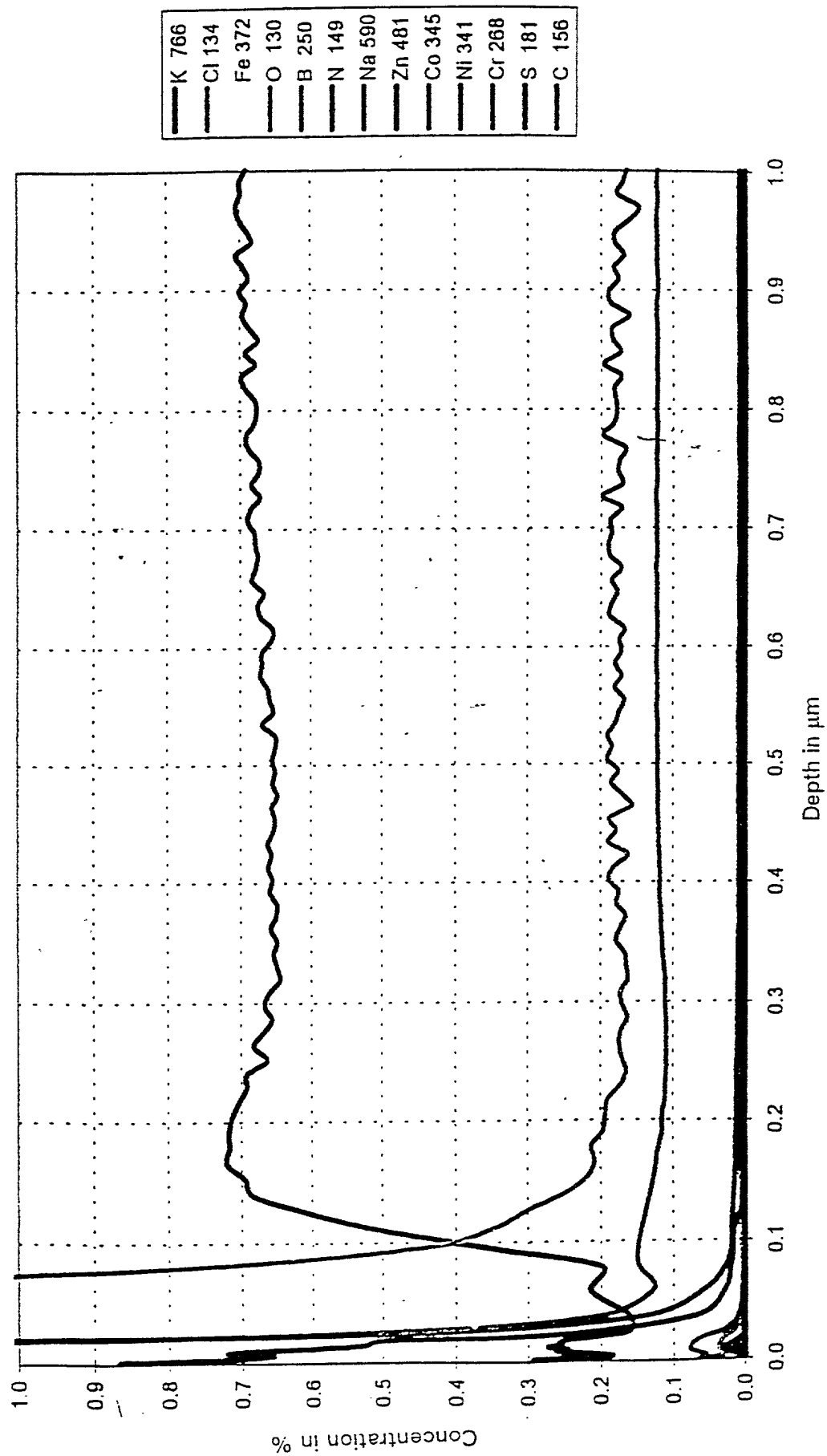
Diagram 1

TOEFCO E6640560

Diagram 2

Sample 8, Measurement Position A

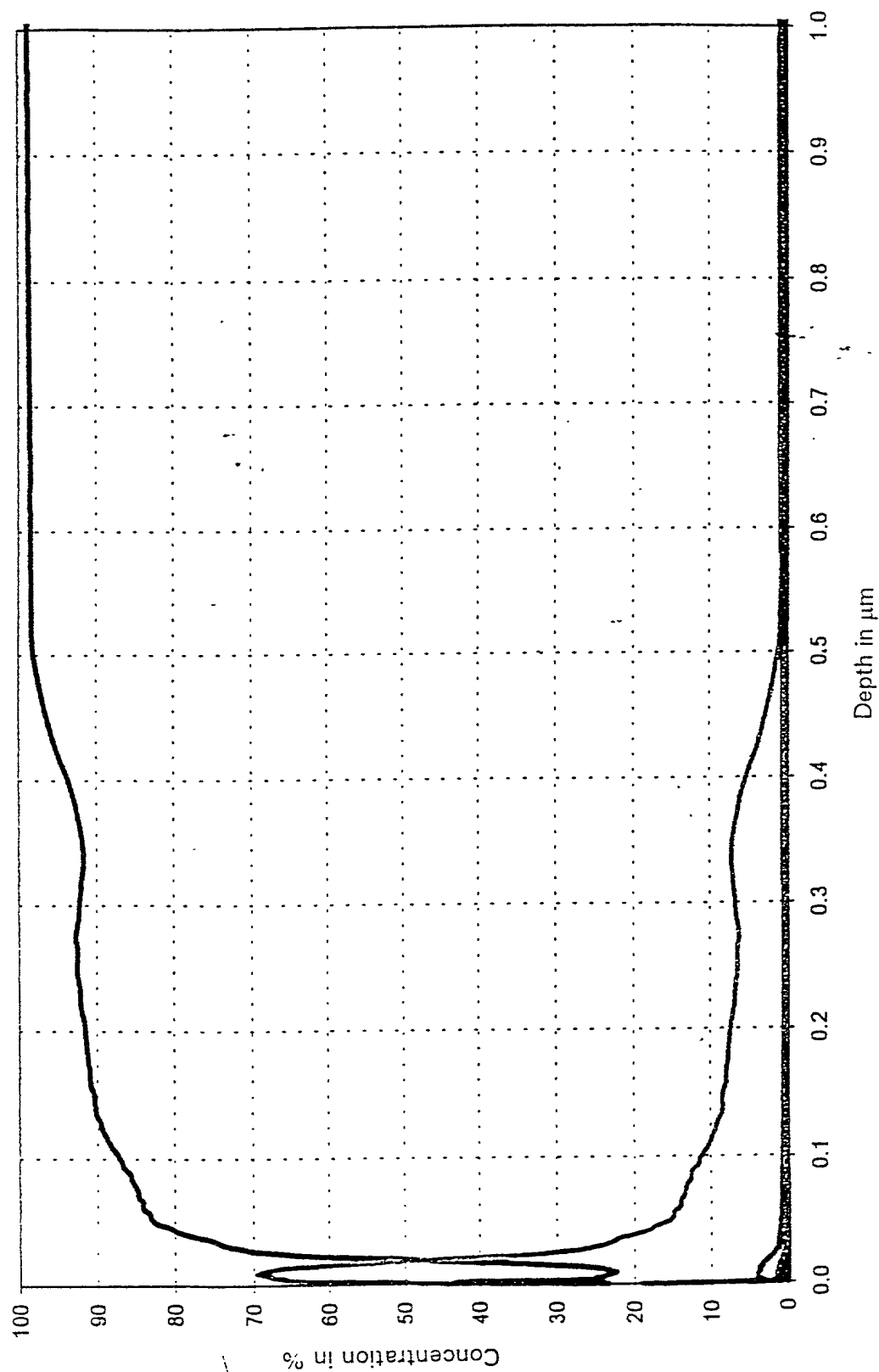
FIG. 32





TDE Diagram 1640650

Sample 9, Measurement Position A



—	K 766
—	Cl 134
—	Fe 372
—	O 130
—	B 250
—	N 149
—	Na 590
—	Zn 481
—	Co 345
—	Ni 341
—	Cr 268
—	S 181
—	C 156

FIG. 34

Sample 9, Measurement Position A

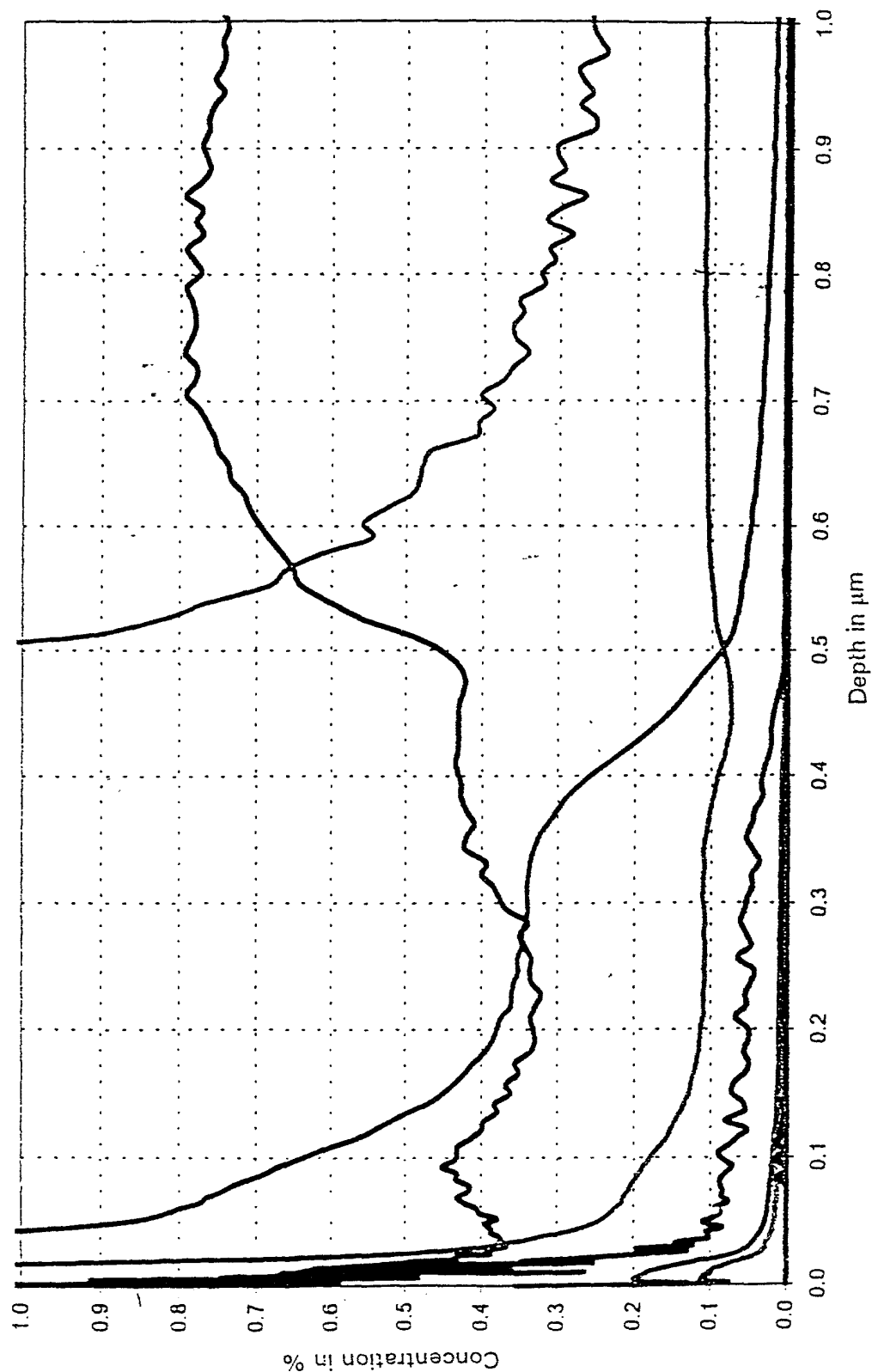
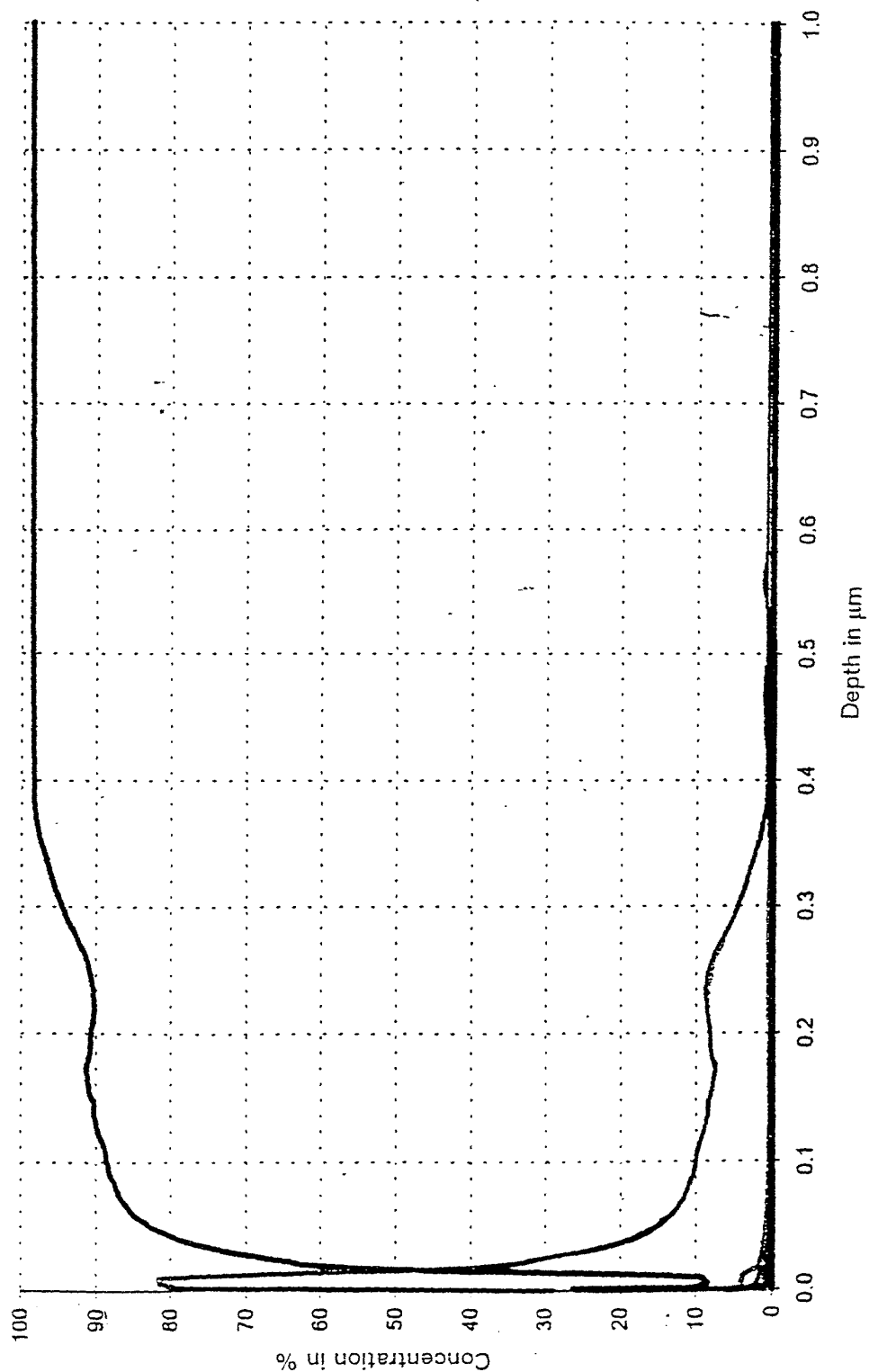


FIG. 35

Sample 9, Measurement Position B



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—	K 766
—	Cl 134
—	Fe 372
—	O 130
—	B 250
—	N 149
—	Na 590
—	Zn 481
—	Co 345
—	Ni 341
—	Cr 268
—	S 181
—	C 156

Diagram 2

Sample 9, Measurement Position B

FIG. 36

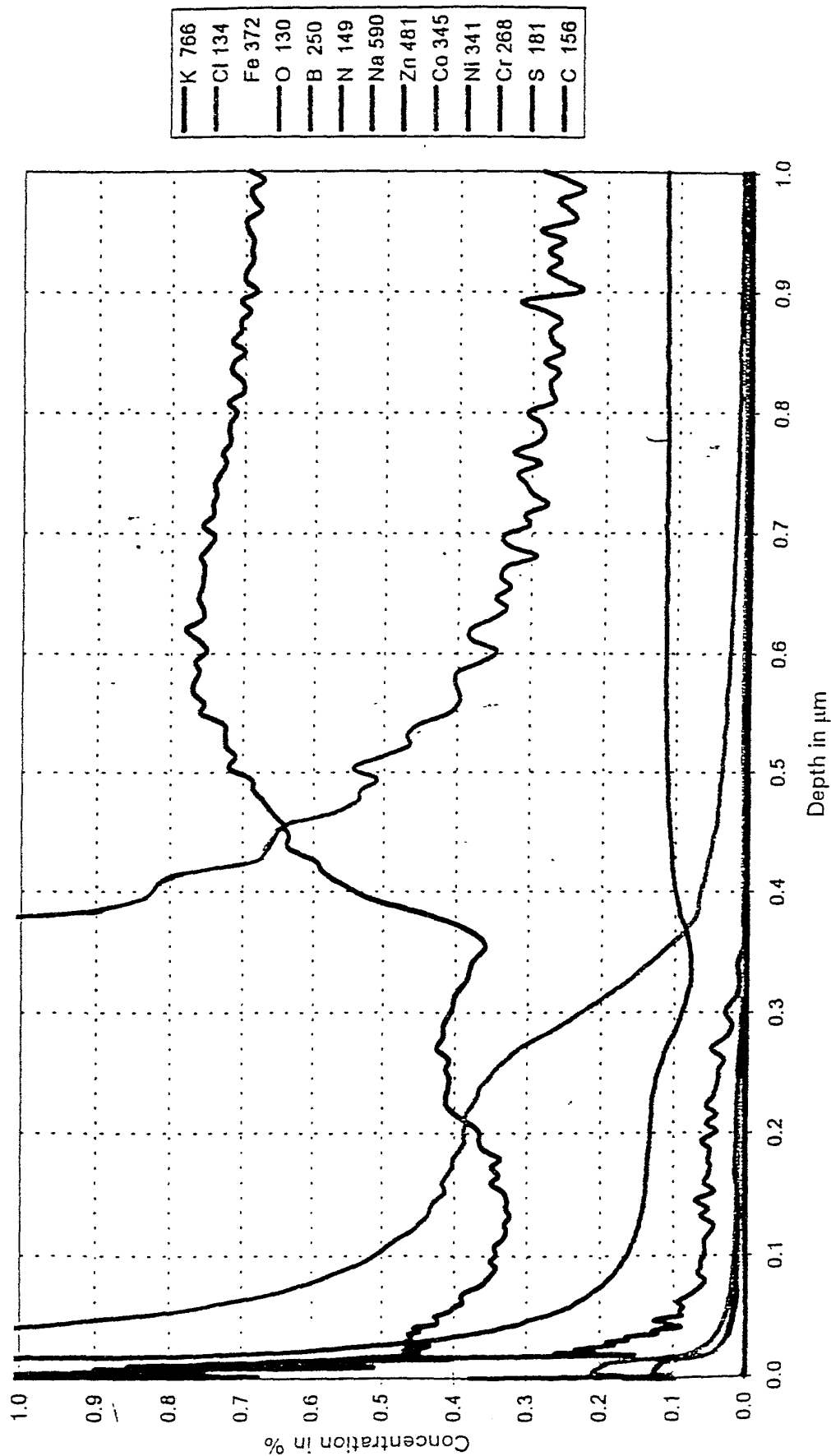
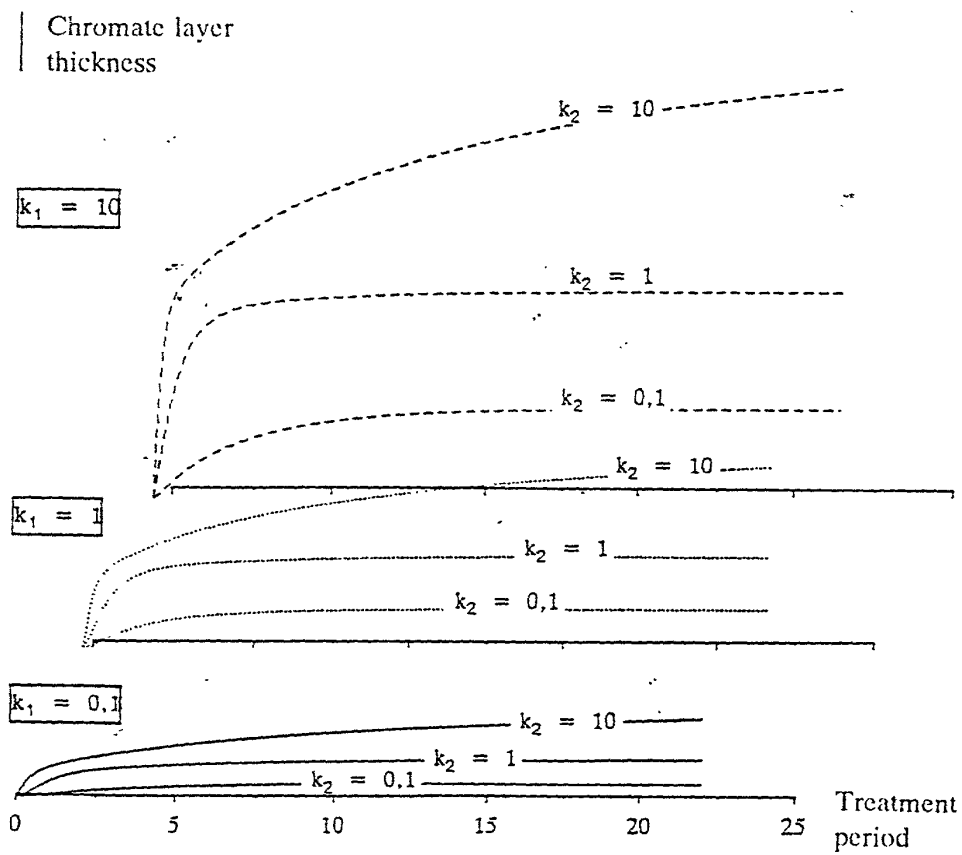


FIG. 37

57750							
	Methods		SEM nm	Glow-discharge spectrometer		nm (Cr > 30%)	Sample No.
	Ellipsometry nm	nm (Cr > 1%)		with Cr (%)	chromium index		
1. Prior Art							
Yellow chromation Cr(III) + Cr(VI)	-	300	440	11	48	17	25
Blue chromation Cr(III)	98	60	60	8	5	0	0
2. Invention (Chromitization)							
60 °C Cr(III)	432	300	344	7	23	2	15
100 °C Cr(III)	595	-	358	10	38	22	28
60 °C on Zn/Fe Cr(III)	-	-	282	6	16	0	16
100 °C, two-fold concentration Cr(III)	953	-	-	-	-	-	-
							1,2,3,4,5
							6
							7

Fig. 38

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Computer simulation of the kinetic model of  
chromate coating of zinc for various rate constants